SCIENTIFIC AMERICAN

[Entered at the Post Office of New York. N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION. ART. SCIENCE. MECHANICS, CHEMISTRY AND MANUFACTURES.

Vol. XLV.—No. 20. [NEW SERIES.] NEW YORK, NOVEMBER 12, 1881. [$3.20 per Annum. [POSTAGE PREPAID.]

OUR GRAIN CROP AND ITS COMMERCIAL IMPORTANCE.

During the past decade the production of breadstuffs in this country, as shown in the latest census reports, has been nearly doubled. During the same period the exportation of breadstuffs has increased fourfold. It is now more than ten times as great as it was twenty years ago, and more than twenty times what it was thirty years ago. As given by the Bureau of Statistics the total exportations were:

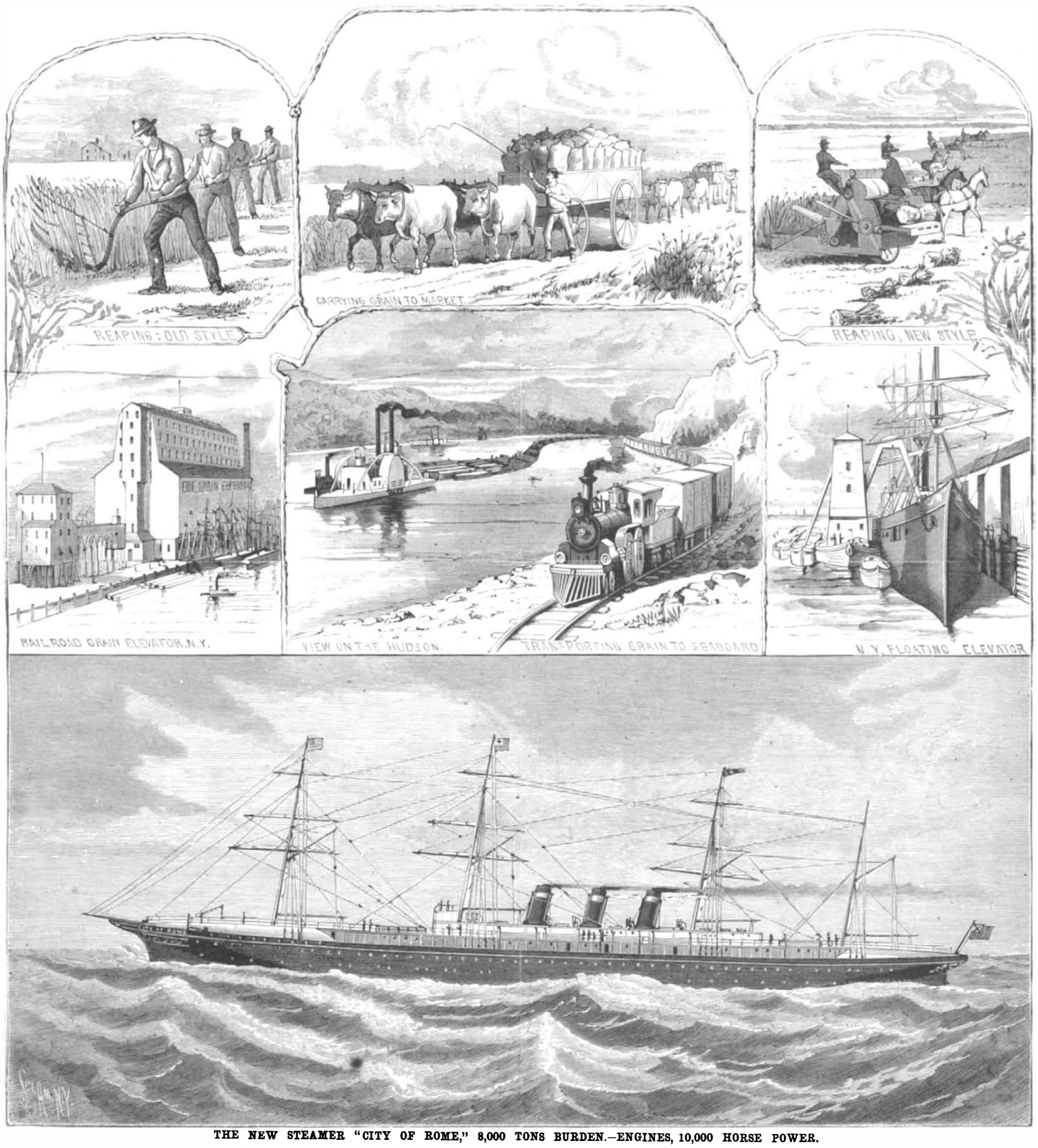
In 1850	$13,066,509
" 1860	24,442,320
" 1870	72,250,933
" 1880	288,036,835

In 1850 the total production of wheat was a little over a hundred million bushels, of which the portion exported was less than four-fifths of one per cent. In 1880 the yield was close upon 450,000,000 bushels, of which 34¼ per cent was exported. Of the second great staple, corn, the yield in 1850 was nearly 600,000,000 bushels, of which 1·11 per cent was exported. In 1880 the yield was nearly 1,548.000,000 bushels, 6·34 per cent being exported. The entire grain crop of last year—corn, wheat, barley, oats, rye, etc.—approached 2,700,000,000 bushels, valued at $2,000,000,000. During the first eight months of the current year the exportation of breadstuffs has exceeded $20,000,000 a month, a material falling off from last year's business, owing partly to better crops abroad and partly to the fact that prices have been kept up by speculative holding of grain for higher prices.

The apparent increase in the corn crop during the past decade was 133 per cent. In the census year (1879) the three principal corn-growing States produced more corn than the entire country did in 1869. The increase in Kansas was fivefold, and in Nebraska still greater.

The gain in the wheat crop was 73 per cent in the last

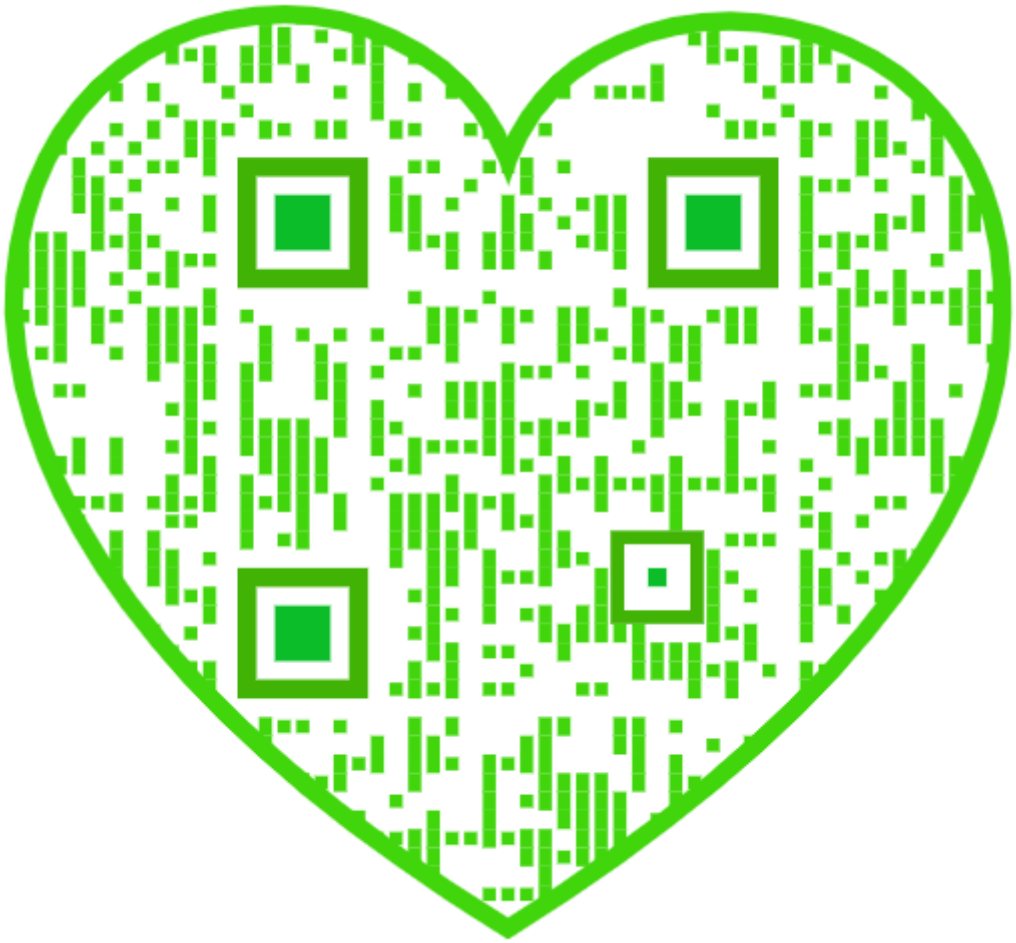
[*Continued on page* 308.]



THE NEW STEAMER "CITY OF ROME," 8,000 TONS BURDEN.—ENGINES, 10,000 HORSE POWER.

THE COMMERCE OF NEW YORK.—TRANSPORTATION, STORAGE, AND SHIPMENT OF GRAIN.

© 1881 SCIENTIFIC AMERICIAN, INC



Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year postage included..... $3 20
One copy, six months, postage included 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each: additional copies at same proportionate rate. Postage prepaid.

Remit by postal order. Address

MUNN & CO., 37 Park Row, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers Single copies, 10 cents. Sold by all news dealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year postage free, on receipt of *seven dollars*. Both papers to one address or different addresses as desired.

The safest way to remit is by draft postal order, or registered letter.

Address MUNN & CO., 37 Park Row, N. Y.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO. 37 Park Row, New York.

NEW YORK, SATURDAY, NOVEMBER 12, 1881.

Contents.

(Illustrated articles are marked with an asterisk.)

Agricultural inventions 309
Air, comp., for elevated railroad 304
American Institute Exhib. notes 306
Ancients, the, longevity of..... 308
Ants, military, of the Amazon... 314
Atmospheric pressure..... 309
Beveling machine, plate glass*.. 310
Bottles, to cut off (3)..... 315
Buffalo skins, new use for..... 307
Calcium 312
Canal, Panama, the..... 309
Cannon, Lyman-Haskell..... 304
Cement (14) 315
Cement and plaster, painting of. 309
Cements (13)..... 315
Coal, the nature of..... 310
Compressed air for elevated R.R. 304
Conventionality in designing ... 304
Copper in subnitrate of bismuth. 304
Cotton fiber, structure of..... 305
Deadly fly, the, in Texas. 309
Designing, conventionality in... 304
Drilling, fine..... 307
Energy, expend. of in incan. light 311
Engineering inventions..... 307
Exhibition notes, Am. Institute. 306
Exhibition, proposed, in Boston. 305
Extraction of sulphur from ore.. 311
Fabrics, woven, oil painting on.. 314
Fiber, cotton, structure of..... 305
Fisheries, U.S., of the great lakes 314
Fly, deadly, the, in Texas 309
Grain crop.—Its com. importance* 303
Hotel, large, moving of a..... 306
Inventions..... 308
Inventions, agricultural..... 309
Inventions, engineering..... 307
Inventions, mechanical..... 311
Inventions, miscellaneous..... 312
Inventions, new..... 310
Inventions, recent 307
Itch in horses (4)..... 315
Lakes, great, U.S. fisheries of the 314
Light of the stars, the 314
Longevity of the ancients..... 308
Lyman-Haskell cannon..... 304
Mechanical inventions 311
Medals, etc., reproduction of.... 305
Military ants of the Amazon..... 314
Motor, small, wanted..... 309
Moving of large hotel..... 306
Nature, the, of coal..... 310
Notes and queries..... 315
Oil painting on woven fabrics ... 314
Organ reed, new*..... 307
Painting of cement and plaster.. 309
Painting, oil, on woven fabrics... 314
Paint, transparencies prod. by ... 314
Panama Canal, the..... 309
Pipette, convenient, a 312
Plate glass beveling machine*... 310
Pneumatic riveting machine*.... 306
Reed, organ, new*..... 307
Riveting machine, pneumatic*... 306
Skins, buffalo, new use for..... 307
Shot case and distributer*..... 311
Stars, the light of the..... 314
Sulphur, extraction of from ore. 311
Telegraph wire jointer*..... 310
Tools, new*..... 307
Transparencies prod. by paint ... 314
U.S. fisheries of the great lakes.. 314
Vise, improved*..... 311
Wasps and their nests*..... 313
Wire jointer, telegraph*..... 310
Woven fabrics, oil painting on... 314

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT.

No. 306,

For the Week ending November 12, 1881.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ENGINEERING AND MECHANICS.—Siemens' Electric Tramway at Paris. 1 illustration. The Electrical Exhibition at Paris.—The electrical railway..... 4872

Electric Railways and Transmission of Power by Electricity. By ALEXANDER SIEMENS. An elaborate argument in favor of the practical application of electricity for the transmission of power. Critical discussion of Dr. Siemens' lecture by the Royal Society of Arts, London..... 4872

On the Limiting Number of Teeth for Spur Wheels. By Prof. C. W. MACCORD. I. Outside Gearing—Epicycloidal Teeth. II. Inside Gearing—Epicycloidal Teeth. 8 figures..... 4874

Trial Trip of the Almirante Brown, the new twin-screw armor-clad corvette built for the Argentine Republic. 4876

Improved Moulding Machine. 1 figure 4877

The Magnetic Separating Machine at Pribram. 1 figure..... 4877

Brick and Concrete and Concrete Gas Holder Tanks. By W. H. EDINGER. Prize paper, Institute of Civil Engineers. Construction of tanks. 5 figures. Sections of walls at dry well, trench, and pier.—Timbering, etc.—Composition of the concrete.—How the concrete was made..... 4877

Concrete for Embankments and Dams..... 4879

II. NATURAL HISTORY, ETC.—The Population of Prussia..... 4877

Expansion and Contraction of Tree Trunks..... 4881

Varieties of Linseed in English Commerce By E. M. HOLMES.—24 figures..... 4882

The Army Worm.—1 figure.—Larvæ, pupa, and moths in an oat field..... 4884

Poultry Farming.—19 figures.—Examples of rare poultry raised in Germany..... 4884

Timber Trees from Seeds..... 4886

III. GEOGRAPHY, GEOLOGY, ETC.—The Present State of Mount Etna and the Valle del Bove.—2 figures.—Mount Etna as seen from the Port of Catania.—Map of the upper region of Etna..... 4881

IV. TECHNOLOGY AND CHEMISTRY.—Destructive Distillation. By OWEN MERRIMAN" 4880

Preparation of Neutral Oxalate of Potassium. By E. B. SHUTTLEWORTH..... 4880

V. METEOROLOGY.—Rain Drops, Hailstones, and Snow Flakes..... 4886

VI. ARCHITECTURE, ETC.—The New Cincinnati Union Depot.—1 figure..... 4876

THE NEW LYMAN-HASKELL CANNON.

The Lyman-Haskell accelerating or multicharge cannon is made with a succession of cylindrical chambers called "pockets" below the bore whose axes point toward the muzzle of the gun and form with its axes angles of about 60 degrees. In these pockets are placed the accelerating charges of powder that ignite after the passage of the projectile, which is started by the explosion of the initial charge in the gun chamber, in the usual manner.

Col. J. H. Haskell, of New York, adopting the accelerating principle first introduced by A. S. Lyman, also of New York, the inventor of the "Lyman accelerating gun," has made a number of improvements on it which are now the property of these two gentlemen jointly with their assigns.

The new Lyman-Haskell gun is expected to throw a projectile four calibers in length a distance of ten or twelve miles, leaving the gun at a velocity of 4,000 feet per second, which, it is claimed, can be done without the danger of bursting the piece, which would occur if the necessary force were generated by the explosion of a single charge.

A number of tests of the principle have been made; notable among them are those at the Washington Navy Yard, where a 2½ inch accelerating gun was tested in competition with a 5 inch Whitworth (English) gun. The target consisted of 5 inches of iron plates backed with 18 inches of oak timber. At a distance of 200 yards, the projectile from the accelerating gun went entirely through this target and landed 100 yards beyond it, while the English projectile fired from the same distance, with double the charge of powder, failed to penetrate the same target. Gen. John Newton, U. S. Engineers, finds that a 10 inch accelerating gun will be as efficient as the 81 ton Armstrong, while a 12 inch accelerating gun will be more powerful than the 100 ton Armstrong.

On the 24th of October a casting was made at the "Scott Foundry" of the Reading Iron Company, for a 6 inch Lyman-Haskell gun. This casting is made without cores, and is to be bored for the pockets and will form the breech section of the gun. Its weight is upward of 50,000. It was cast from two reverberating furnaces charged with 56,000 pounds of cold-blast charcoal pig-iron of the following brands:

Brands.	No. 1 Furnace.	No. 2 Furnace.
Maiden Creek	3,680 pounds.	2,745 pounds.
Juniata	3,670 "	2,745 "
No. 2 Richmond	15,425 "	11,555 "
Falling Spring and No. 1 Franklin	4,775 "	3,575 "
Remelted iron	4,545 "	3,400 "

The section to form the muzzle portion will be cast separately, and firmly joined by socket to the breech section. The whole is to be then lined with steel in one continuous cylinder for the bore and smaller ones for the pockets.

The weight of the gun when completed will be 25 tons, with a total length of 24 feet 11½ inches. It will have a bore of 6 inches, and will carry a ball weighing 150 pounds, of 4 calibers length. Eighteen pounds of hexagonal powder will be used in the breech, with 28 pounds of powder of finer quality in each of the four pockets, making a total of 130 pounds. This is one hundred pounds more of powder than is ordinarily used, and by means of this system of explosion, the projectile will have a penetrating power as 1½ is to 4, compared with other cannon. The initial velocity of the ball will be 4,000 feet in a second, while that of other guns is from 1,500 to 2,000. The ball is calculated to penetrate two feet of wrought iron at a distance of 200 yards. By means of the successive discharges of powder from the four pockets the pressure upon the ball will be maintained, thus giving it its great velocity, which will carry a ball twelve miles. The explosion takes place in tough steel, supported by the strongest cast iron. After its completion, which will be in several months, the gun will be taken to Sandy Hook, where it will be thoroughly tested in the presence of army officers and distinguished scientists.

Conventionality in Designing.

An instructive commentary on our recent criticism of the conventional work of the art schools, as contrasted with the genuinely artistic work of our tool makers and machinists, is furnished by the recent competition in wall paper designs instigated by Messrs. Fuller & Warren.

Speaking of the disappointment occasioned by the designs sent from France the critic of a morning paper says:

"Without being able to lay our hands at once upon the original sources of these designs—without even wishing to say that they are copies—we yet know that there is nothing in them that is not familiar; they are mere variations, and not at all clever ones, on the fashionable stock-in-trade of the day. Some of them are suggestive of the tapestries of French manufacture. One of them has a "filling" that is inspired by Persia; there are two very good borders, skillful treatment of old models, but of the most of them Japan is the fruitful mother—Japan treated rather cavalierly, after the French fashion. But whatever it may be—tapestry, Persia, or Japan—it is all copying, skillful, accomplished, and thorough workmanship, but all inspired by books and all drawn from the brains of other men."

In a later paper, speaking of the absence of originality displayed in nearly if not quite all of the designs submitted, the critic is constrained to say that "it is beginning to be felt that the production of good designs by any of the now long-tried methods of art schools, schools of design, South Kensington schools, and the like, is less and less to be depended on. There has been for some time in England much groaning and complaint over the failure of the costly governmental methods employed to stimulate the faculty of design in the British subject, and whether the peoples of the continent are as well alive to their own failure or not, it is nevertheless true, that not only the Germans, the Austrians, and the Italians, but even the French, are reduced to the imitation of the work of the past in every department of manufacture calling for design. It is true they have carried this imitation, not only in the design, but in the manufacture itself, to the very highest point of perfection, so that the brocades and stuffs of all kinds, the metal works, the ceramics, the tapestries, carving in wood and stone, the glass, etc., that are produced to-day are, in all cases where price is of no importance, as well made as they ever were at any time, and even when a cheaper market is looked for these things are often of a very high degree of excellence. But original design has by no means kept pace with manufacture, and though there are a few striking exceptions to the statement, it may be safely said that in design to-day we are dependent on the work of those who have gone before. The design of to-day consists in clever copying or clever combining of what has been produced by other people in other times."

Medals for Electric Lights.

The jury of the International Electric Exhibition has awarded gold medals of the highest class to Edison and Brush for dynamo-magnetic machines, and a gold medal to Maxim. Also, gold medals to Edison, Brush, and Maxim for arc incandescent lights. Edison takes five gold medals in all, being more than any other exhibitor.

Copper in Subnitrate of Bismuth.

It is well known that commercial bismuth often contains copper, and that even when the percentage of copper is too small to color the nitric acid solution, the blue becomes very perceptible upon the addition of ammonia for the purpose of precipitating the subnitrate. At first thought we are inclined to think that the ammoniacal compounds of copper, being very soluble in excess of that alkali, would be easily removed by washing, but experience proves that this is not the case, as no ordinary care, nor even extraordinary perseverance, can remove the blue tint. The following method is, therefore, recommended in cases where it is required to remove copper from bismuth.

The bismuth is first dissolved in cold concentrated nitric acid, preferably an insufficient quantity. On the following day a mass of perfectly white transparent crystals are obtained, from which the bluish mother liquor is to be drained, and the crystals washed with a little strong acid. In a day or two a second crop of crystals are obtained, and are also drained and washed in the same way. If by this time the mother liquor has become dirty or full of black specks, it is filtered through gun cotton. It may be necessary to concentrate it somewhat toward the end to obtain the last crop of crystals. Nitrate of copper, being exceedingly soluble, remains in solution to the last. When no more crystals are obtainable the little bismuth still in solution may be precipitated by ammonia, washed, dried, and worked over again. The different crops of crystallized nitrate of bismuth are triturated with a little water and poured into water, or ammoniacal water, as preferred. In case it is merely precipitated by water, about one-fourth remains in solution, and can be recovered from the filtrate by means of an alkaline carbonate in the form of subcarbonate of bismuth, a preparation of equal value to the subnitrate. Where purification by crystallization has not preceded the precipitation of the subnitrate, the second product, namely, subcarbonate from the filtrate, is frequently of a dark color, since all the foreign metals present in the whole of the original material are here concentrated into one precipitate.

Melbourne Awards.

Messrs. Joseph Burnett & Co., of Boston, received at Melbourne the first order of merit for flavoring extracts and the second order for colognes and chemical products, instead of the second and third orders respectively, as was stated in the report of American awards at that Exhibition printed in the SCIENTIFIC AMERICAN SUPPLEMENT of July 2.

Electric Light in Rail Cars.

Recently the Brighton (Eng.) Railway Company introduced the electric light on a special train of Pullman cars. Thirty-two Faure secondary batteries were employed to the car, to operate a dozen Swan lamps. The illumination was said to have been satisfactory.

A Compressed Air Motor for Elevated Railways.

A very promising trial was lately made of a compressed air motor on the Second Avenue Elevated Road. The air was stored in four tanks, under a pressure of 580 pounds. After running from 127th street to 42d street and back, making the usual stops, the pressure was reduced to 125 pounds. The inventor claims that with proper facilities at each end of the road the motor can be charged in from two to three minutes time.

© 1881 SCIENTIFIC AMERICIAN, INC

THE STRUCTURE OF COTTON FIBER IN RELATION TO DYEING.

The organic structure of the various cotton fibers of commerce, as affecting their use in spinning and weaving, was considered in a previous article. Let us now examine briefly the influence of fiber-structure upon the work of the dyer.

In what manner does the fiber receive the dye, and what changes are wrought in the structure and chemical composition of the fiber in the processes of dyeing?

The fiber, as we have seen, is a slender, twisted, usually more or less flattened cellular tube, the outer walls of which show no openings even under a powerful microscope. When perfectly ripe the fiber consists of almost perfectly pure cellulose, a compound of carbon, hydrogen, and oxygen ($C_6H_{10}O_5$), having but slight affinity for other substances, except strong acids and alkalies.

Obviously there are many supposable ways in which such a structure can be dyed: by the laying on of dyestuff like paint upon the surface of the fiber; by the filling of the tube with liquid dye, which may or may not afterward be precipitated in solid form; by saturating the cell walls with dye; by a chemical union of the substance of the fiber with the dyeing materials, etc.

It is quite probable that each and all of these methods will be found to operate singly or in combination under the varying conditions obtaining in dye houses.

The fixation of the color in the fiber is effected, according to Chevreul, in three ways: by chemical affinity, by simple mixture with the fibers, or by a combination of the two. The English investigator, Mr. Walter Crum, holds that in the dyeing of cotton fiber the action is purely mechanical, and that reactions which occur in the fiber are not effected by the chemical composition of the fiber. The fiber, he says, serves simply as a containing vessel, and is as inert as a glass tube might be. The peculiar structure of the cotton fiber, however, enables it to take in liquids which contain coloring matter in a feeble combination with the solvent liquor, and to retain such matter when the liquid is removed or the dye precipitated by a reagent. The energy of the absorbent action of cotton fiber is so great that some dyes will penetrate the fiber even when the dyestuff is applied in a condition almost solid. Other dyes do not so strongly support the theory of Mr. Crum. Thus, aniline colors, which are eagerly absorbed by silk and wool, have little effect upon unprepared cotton fiber, except to stain the surface.

The more recent investigator, Mr. F. H. Bowman, reviews in his new work the grounds of Mr. Crum's position, and decides that something more than mechanical action is needed to account for the conditions observed under the microscope. With respect to their action upon the fiber of cotton he finds three classes of dyeing substances:

(1) Those which are colored in themselves; simple dyes having a direct affinity for the fiber without the intervention of a mordant.

(2) Those which are true chemical precipitates formed within the fiber walls; with these the fiber acts mechanically and does not in itself undergo any change.

(3) Those requiring a mordant. With these the color is not produced by the simple union of the coloring matter with the fiber, but by the action of various reagents upon the mordant, which unites with the fiber and thus fixes the color.

He adds that it is not possible to draw a sharp line of demarkation between these three classes of action, because in the relationship of various coloring matters to the fibers they shade into one another; and there are many instances in which the difference is only one of degree. Examples of the appearance of fibers under the microscope, after treatment with the different types of dyestuffs, are shown by Mr. Bowman in a series of beautifully colored illustrations.

Turmeric yellow and indigo blue illustrate the action and appearance of the first class of dyeing material. With turmeric yellow the coloring matter is simply dissolved in hot water; immersed in the decoction the fiber speedily acquires a bright yellow color, which is rendered as permanent as the color will permit by simply drying the yarn. The coloring matter is not merely entangled in the cell structure of the fiber, for it cannot be dissolved out by a reapplication of water. There is an evident union of some sort with the fiber substance. The aggregation of coloring matter within the cell walls shows further that the fiber has the power of attracting the dye from the water, which is left considerably less colored than the fiber which has been immersed in it. When examined under the microscope by transmitted light the coloring matter is found to be irregularly distributed, the color lying in detached masses in the cellulose walls. In some places, especially when the fiber is kempy or immature, the fiber seems to have no affinity for the dye and is incapable of receiving it. How far and in what way the presence of foreign matter, such as wax, oil, and cell contents, interferes with the proper action of the cellulose layers and prevents uniform dyeing, does not appear.

The affinity of cotton fiber for indigo is such that the fiber tends to accumulate the indigo within the cell walls in quantity almost proportionate to the time during which it is in operation. With a sufficient quantity of cotton all the indigo may be extracted from the solution.

When the dyed fiber is viewed under the microscope the cloudy deposit of indigo is seen distributed irregularly through the fiber, in some places forming dark, almost black, masses in the central cavity. There is also a certain degree of surface coloration, and an accumulation of color in the creases, on the wrinkled and broken surface of the collapsed tubes, or in the ridges and furrows occasioned by the hollows of the twisted fibers. To the reflecting surfaces so formed the solid and even appearance of this dye is largely due. A careful examination of the best dyed fibers, however, convinces Mr. Bowman that we are far from the standard of perfect dyeing, and that the mechanical treatment of the fiber is much more advanced than the chemical.

The second class of dyeing substances, where true chemical precipitates are formed within the fiber walls, is best illustrated by the pure mineral dyes, such as chrome yellow, Prussian blue, etc. In these the reaction within the fiber producing the color is exactly the same as that which occurs in the test glass on the laboratory table, when testing for lead or iron; and the great problem for the dyer to solve is so to prepare the fiber that it will best receive the solution from which the coloring matter is to be precipitated.

Mr. Bowman finds that in many cases with these purely mineral dyes the cellulose may be entirely dissolved away by properly selected solvents, leaving the dyes in an unchanged condition, showing that they had not entered into chemical union with the fiber. In other cases there seems to be a degree of affinity between impure cellulose as it always exists in the cotton fiber, and the first solutions in which the fiber is immersed in order to produce the purely mineral dyes, so that they may act to some extent as mordants. Thus he found by experiment that when cotton fiber was steeped in acetate of lead (the first process in the dyeing of amber), or in nitrate of iron (the first step in dyeing Prussian blue), he could not by any process which did not entirely destroy the fiber remove all traces of these bases. The inference was that something more than mere mechanical union had taken place between them and the fiber; and although the cellulose itself might play no part in the subsequent reactions, the fixity of the color seemed to be due in part at least to the reaction of the bases upon the cellulose, making the dyes to a certain extent chemical as well as mechanical.

The third class of dyeing substances (where a mordant is used) is greatly variable in nature and application. In some cases there seems to be what may almost be called the formation of a new surface within the fiber walls, or even upon the surface of the thread (but permanently attached to it), upon which the coloring matter is deposited. Thus pure cotton fiber will not receive and hold an aniline dye, but when first treated with a solution of tannic acid the fiber will take up the color in large quantity and hold it permanently.

Under the microscope fiber dyed with any of the aniline colors shows a much greater uniformity in the levelness of the dyeing than obtains with indigo. Sections of the fiber seem to be uniformly colored all through the cell walls, and there is a comparative absence of surface coloring and the tendency to form detached masses of dye. Some fibers indeed seem to be perfectly dyed in every part, as though the mordant had penetrated every portion of the cell walls. This is true only of perfect fibers; unripe fibers naturally resist the color.

To make these refractory fibers receive the dye they have to be treated with strong alkali, "mercerized," which has the effect of thickening the cell walls and increasing their power of absorption. Mr. Bowman finds that such unripe fibers could also be made to receive aniline dyes by first bleaching them or by boiling them for a time in a weak solution of alkali. This increased capacity for dyeing, he thinks, may arise from the removal of waxy matter from the outer layer, or else from the opening of the pores of the fiber, although the same treatment seems to diminish the power of the tube wall to act as a dialyzer when treated with salts of alumina.

Alumina has a special interest in connection with cotton fiber, not only because of its peculiar property, when in its hydrated condition, of throwing down and heightening the brilliancy of many vegetable and animal coloring matters, but also because of its being separated from its various compounds by the dialytic action of the fiber alone, and thus retaining these coloring matters within the cell walls in an insoluble condition. Upon this action depends the process of dyeing Turkey red, one of the most stable of all colors.

The manner in which coloring matters of this class are associated with different fibers—kempy, unripe, fully ripe, etc.—is admirably shown in Mr. Bowman's illustrations. After treatment with lake of alumina and madder the kempy fiber shows many parts quite uncolored. In the unripe, horny fiber the coloring matter is confined to a thin layer, which by the act of shrinking has separated into detached flakes distributed irregularly through the thin tube. The fully dyed fiber shows the accumulation of coloring matter in the interior of the tube. In the transverse sections of fiber some are faintly colored in spots; others show the dye collected in clots within the tube. The distribution of the dye in the cell walls is also irregular. Sometimes the dye lies in layers; other fibers are uniformly tinted throughout; still others show an uncolored outer skin with a well dyed interior.

After considering at length the conditions of the fiber and the accidents of handling which interfere with the work of the dyer, Mr. Bowman expresses the opinion that increased efficiency in the coloring of yarn and fabrics must be looked for in the discovery of new preparatory processes which, like the strong alkali treatment, will increase the capacity of the fiber for receiving dye, especially imperfect and immature fibers, and also give to the mature fiber greater toughness and strength. Here would seem to be a promising field for investigation and invention. The wonderful change which occurs in the manufacture of parchment paper, by which the strength of the paper is increased eight or ten fold, indicates that there must lie within the reach of possible discovery a corresponding chemical process of strengthening cotton yarn while dyeing it, since both the paper and the yarn have the common basis, cellulose.

REPRODUCTION OF MEDALS, ETC.

There are several methods by which medals may be reproduced, and of these the following are the simplest and afford the most satisfactory results:

THE STEREOTYPE PROCESS.

The medal, thoroughly cleansed, dried, and coated with a thin but uniform film of pure sperm or olive oil, is bound around the edge with a piece of cardboard so as to form a box, the bottom of which is the medal. A small quantity of finest plaster of Paris is then mixed up quickly into a thin cream and applied all over the exposed surface of the medal with a camel's-hair pencil so as to fill all depressions and exclude air bubbles. A thicker cream of plaster is then at once poured in until the box is nearly or quite filled. When the plaster has properly hardened the cardboard is taken off, and the plaster adhering to the rim of the medal trimmed off with a knife; the medal can then be easily detached from the cast. Another cast may then be taken of the reverse side of the medal in a similar manner. These casts, after trimming, are set aside in a warm place until they become quite dry, and are then clamped securely, face upward, in a small shallow iron tray, so that their face is about half the thickness of the medal distant below the top or edge of the tray. The spaces in the tray about the casts are then filled up even with the inferior edge of the casts with plaster, *papier mâché*, or clay (dry). The tray thus arranged is put into an oven until the temperature of its contents is uniformly heated to about 250° Fah., when it is removed and immersed wholly below the surface of a potful of ordinary type metal heated just hot enough to make it quite liquid. As soon as air bubbles cease to escape the tray is slowly and steadily raised out of the pot, and the contents allowed to chill and harden in the air (sometimes it is preferable to plunge it in water, so as to facilitate the removal of the "cake" from the tray). When the plate of type metal is cut out of the tray a correct (reversed) copy of the plaster moulds will be found on its under surface, and when the superfluous metal has been cut away and the pieces trimmed to proper dimensions and thickness they may be soldered together back to back, and the edges cut, turned, or milled, as the case requires to produce a correct imitation of the original medal. Cleansed by dipping momentarily in a strong hot solution of caustic potash, and, after quickly rinsing in running water, in hydrochloric acid, it may be coated with silver or copper, if desired, by electro deposition.

BY ELECTROTYPY.

Melt pure white wax, and stir well into it while cooling about one-fifth its weight of finest flake white (plumbic carbonate). Having uniformly coated the faces of the medal with a film of finest graphite or plumbago, arrange it in the box of cardboard as in taking the plaster stereo cast, and pour in the wax preparation previously heated just enough to make it semi-fluid. Having thus obtained a mould in wax of both faces of the medal, harden the wax in a cool place, then coat it perfectly with a film of pure graphite, wrap about the edges a number of turns of clean copper wire, and brush on plumbago so that the film of the latter may have contact with the wax and wire all around. Suspend the wax cast thus prepared by the copper wire in a saturated (or nearly saturated) aqueous solution of *pure* sulphate of copper, jarring it so that all bubbles of air may escape from the deep lines of the cast. Close in front, but not touching the immersed mould (or its connections), suspend by a copper wire a sheet of clean copper. Connect the copper by stout copper wire with the silver (or carbon) pole of a Smee battery of three cells (in series), and the copper wire on the mould, in a similar manner, with the zinc pole of the same battery, and let the deposition of copper on the mould proceed until it becomes thick enough to separate without breaking (about as thick as this paper). Then carefully detach it from the mould, embed the pieces, face downward, in dry plaster, and fill up (after drying) with melted type metal (or fusible metal). Trim to proper size and thickness, solder the pieces together, back to back, and cut or mill the edges to proper form. These *copies* may be coated with a thin film of silver by electro deposit. The surfaces may be given an *aged* appearance by immersing them for a few moments in a dilute solution of sulphide of soda in warm water.

When a copy, as produced by stereotypy, of a medal is taken in metal, the latter coated with plumbago, and immersed in a bath composed of three-quarters of a pound of sulphate of nickel and ammonia per gallon of water, under the conditions described in electrotyping with copper, a hard shell of nickel is obtained, which, when separated and backed with type metal, may be used as a die. It is difficult, however, for an amateur in electro-metallurgy to obtain good results in this way. Steel dies cannot be produced in this way. Moulds for stereo or ordinary casting should be heated.

For a fusible silver-white alloy melt type metal and mix it with one-eighth its weight of grain tin, remove from the fire, and stir well before pouring.

Proposed Exhibition in Boston.

After several months' inquiry the committee appointed to investigate the feasibility of holding a World's Fair in Boston have reported in favor of the enterprise, provided $5,000,000 can be secured. The property known as Beacon Park has been offered as a site for the fair free of rental.

© 1881 SCIENTIFIC AMERICIAN, INC

PORTABLE PNEUMATIC RIVETING MACHINE.

The old-time way of riveting boiler shells and similar work is fast giving way to the more scientific and economical method of doing it by machinery. Our engraving shows one of the simplest and best machines for this purpose. It is operated by compressed air, and is capable of driving rivets as rapidly and effectively as the larger and more expensive steam or hydraulic riveters now in use. Its operation imitates handwork, but the results are superior to handwork.

Fig. 1 shows the riveter operating on the side of a boiler shell. It is supported in a ring, so that it may be turned to any angle or work in any desired position. The hammer is brought into contact with the rivet head by a rapidly reciprocating piston working in the air cylinder, and the anvil is brought up to its work by the air cylinder between the shorter arms of the levers.

The long arms of the levers are made 63 and 76 inches from center of joint pin to the center of riveter, capable of reaching a rivet 60 or 72 inches respectively from the edge of the plate, so as to operate upon the circular seams of a boiler. The levers are turned in the ring by a worm-wheel to place the machine at any desired angle.

The valve of the riveter is operated directly by the pressure in the cylinder without extra gearing, and so arranged that the length of the stroke regulates itself automatically to correspond with the gradual reduction of the end of the rivet as the head is formed.

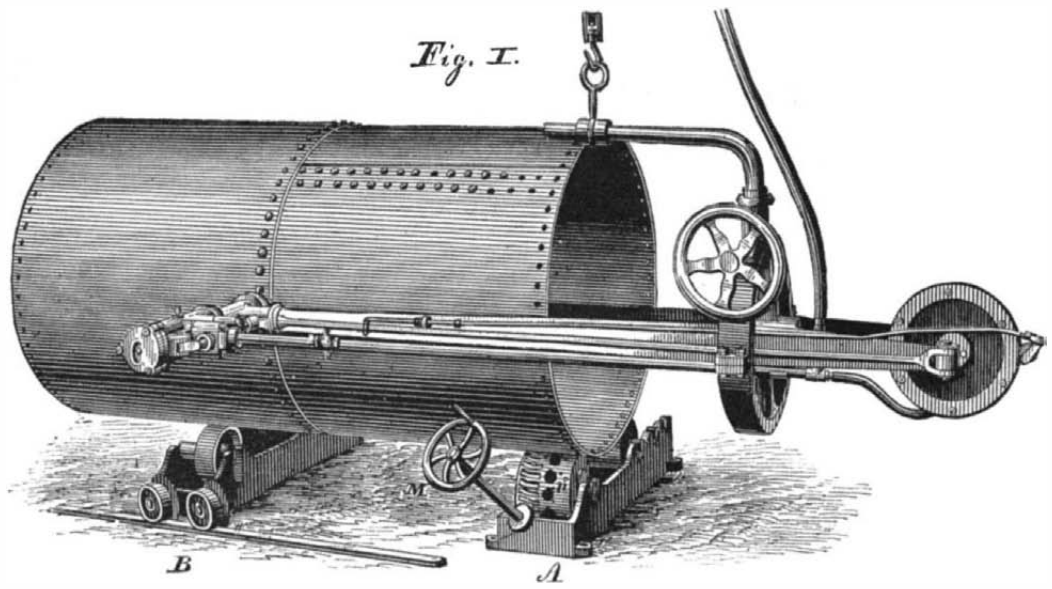
The machine is operated with an atmospheric pressure of from 20 to 30 pounds to the square inch, and makes from 150 to 200 strokes per minute. The time required to form the head of a three-quarter inch rivet is about six seconds, and at steady, straight work, allowing for ordinary detention and loss of time, two rivets can readily be finished in one minute.

The machine may be suspended from a bar arranged overhead to allow a longitudinal motion to the riveter when operating on straight seams, but a traveling carriage, capable of a longitudinal and side motion, is preferable, so that when operating against the side of the boiler shell, as shown in Fig. 1 (which is found to be the most convenient way of operating with the machine), the machine can easily be regulated for any diameter of shell.

Among the many advantages claimed for this riveter are its lightness and portability, its rapidity of action, and the great saving of labor in handling the work, beside turning out a better quality of work than can be done by hand.

This machine is one of the objects of interest at the present fair of the American Institute.

Further particulars in regard to this machine may be obtained by addressing Mr. Henry E. Raeder, 304 Broadway, New York city.



ALLEN'S PNEUMATIC RIVETING MACHINE.

American Institute Exhibition Notes.

Persons who have annually visited the exhibitions of the American Institute have sometimes complained of sameness, but even to the most casual sightseer who may have had occasion to thus complain the exhibition now open at Sixty-third street and Third avenue must be an agreeable exception. The introduction of nearly one hundred Brush electric lights make night as bright as day, and give colors their real shades. Two powerful steam engines are now driving six large Brush dynamo machines at the rate of about 800 revolutions per minute, and their glory is divided among the hundred lights in and about this large building.

This is the fiftieth exhibition given by this Institute, its first having been in 1828, and annually repeated each autumn, except four, since that year. It would be interesting to canvass the difference in the aspect of the world of science and art then and now. The fifty glimpses of it that these exhibitions have afforded would be a fair panorama of progress in most branches of industry, but space is not now available for even a sketch of the improvements that have appeared during these fifty-four years. It may be safely said that no like period has been correspondingly marked, as the age of improvement in arts and sciences. It is the age of steam, of steel, and of electricity.

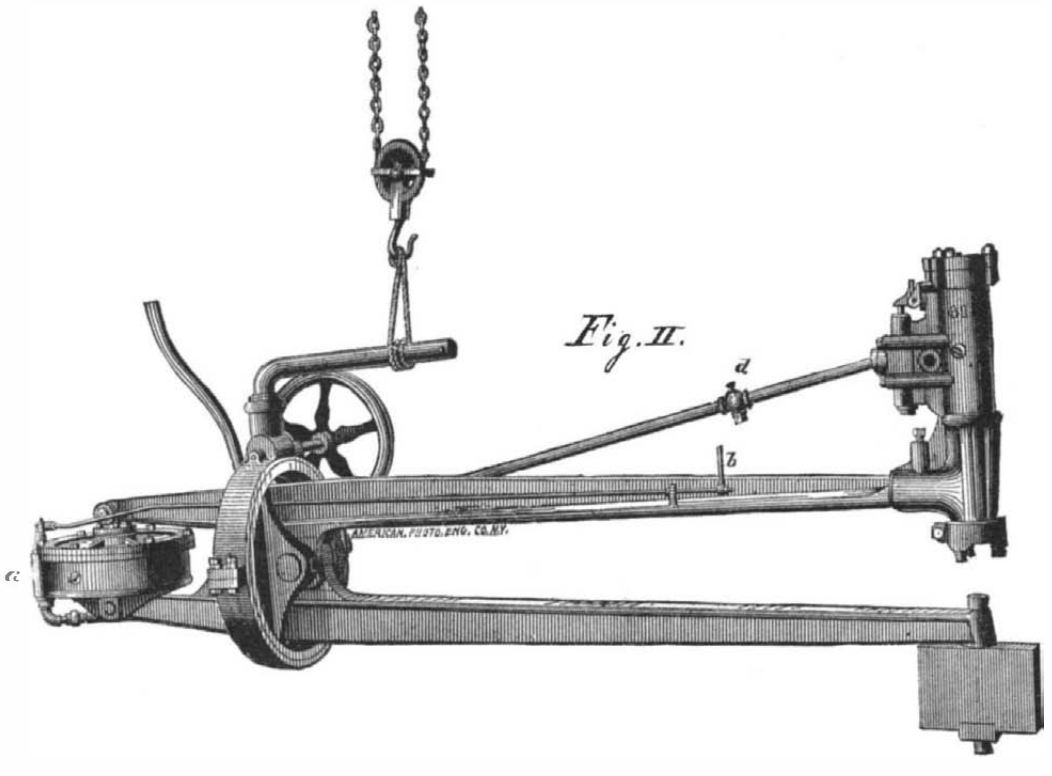
To the careful and the special observers from year to year these exhibitions have shown the successive steps in the grand march of improvement in mechanical industries. Each exhibitor has made some improvement in his specialties, either as to quality of products or facility in producing. From the fireman in his grim attire and with his simple tools, who furnishes the prime force, through all the types of machines that his product moves, and the delicate as well as ponderous products of these machines to the æsthetic and beautiful you may learn the little story of recent technical progress from each.

Among the giants of the exhibition that overcome nature's solider work, destroying instanter the cohesion that for ages upon ages has held the solid rocks in form, is the crushing machine, which will give you a noisy proof of its ability to disintegrate one hundred tons in ten hours of blue stone, granite, or quartz. It is the celebrated Blake challenge rock breaker, gnashing 275 times per minute at its uncanny mouthful of "hardtack." It is manufactured by the well-known Blake Crusher Company, of New Haven, Conn.

The Delamater Iron Works, No. 10 Cortlandt street and West Thirteenth street, N. Y., are exhibiting a fine lot of Ericsson's new caloric pumping engines for domestic use in lifting and forcing water from wells and cisterns, or from Croton pipes to tanks on upper floors of buildings in city or country. They can be operated and attended by any one who can use a cooking stove, and they are as free from dangerous vices as the simplest utensil of the kitchen. They vary in capacity from 200 to 1,600 gallons of water raised to a height of 50 feet.

A sample of the new Otto silent gas machine built by Schleicher, Schumm & Co., 3045 Chestnut street, Philadelphia, is exhibited by their New York agent, A. C. Manning, of 38 Dey street. This engine burns common illuminating gas mingled with common air, and is always ready to start by applying a lighted match. It has lately been much improved, and on account of its cleanliness and safety it is popular as a motor for small power in offices and dwellings.

The Hartford Engineering Company, of Hartford, Conn., builders of the Hartford high speed steam engine, have on exhibition, besides a sample of their engine that drives four of the Brush dynamo machines, a full line of the celebrated Medart belt pulleys. They are made with cast iron spiders or centers and arms, and wrought iron rims, which are riveted to properly formed T-ends of the arms. They are an agreeable departure in mill work, being light and strong, as well as the cheapest pulleys now offered.



PNEUMATIC RIVETING MACHINE.—SIDE ELEVATION.

Vulcanized rubber fabrics for all mechanical purposes are shown in full line by the New York Belting and Packing Company, the oldest and largest manufacturers in this country. They also exhibit fine specimens of rubber-lined cotton fire hose, which receives in the course of its manufacture a vaporous carbolic acid treatment to prevent mildew and rot, to which all cotton goods exposed to wet and dry are otherwise liable. It is known as "cable hose," and is circular wove and therefore seamless. It will stand extraordinary and long-continued internal strain without bursting. Notable among these exhibits are three immense grain elevator belts. One pair called the "Twin Giants" are 36 inches wide, 275 feet long, and weigh 2,800 pounds. A third and still wider is 48 inches wide and 200 feet long, weighing 1,800 pounds. Every variety of vulcanized rubber goods, including the well-known vulcanite emery wheels, can be found at their warehouse, 37 and 38 Park Row, New York.

The Lambertsville Iron Works are driving the two remaining Brush dynamo machines with one of their improved steam engines, 12 x 18, making 116 revolutions per minute. This engine is built upon the new plan of overhanging cylinder with heavy bed, has a new style of balanced slide valve and automatic cut-off valve actuated by a common centrifugal governor. It appears to fill the bill of a first-class high speed engine at a moderate cost. Their works are at Lambertsville, N. J.

Asbestos has now been put to a great variety of uses, both mechanical and ornamental. It is used for all kinds of non-conducting and fire proof coverings of roofs as well as boilers, steam packing and gaskets of all styles, lining felts and sheathings, paints and cements. These goods have proved a boon to steam users. All varieties of these articles, as well as the raw and partly manufactured material, are displayed by the pioneer and leader in asbestos goods, H. W. Johns, of H. W. Johns Manufacturing Company, 87 Maiden lane, New York.

The usual fine display of sewing machines is made by E. Remington & Sons, who exhibit their new Remington variety made at Ilion, N. Y., while their type-writer is made at Ilion, Ill.

Successful Moving of a Large Hotel.

At a recent meeting of the Engineers' Club, of Philadelphia, the secretary read a detailed description of the moving of the Hotel Pelham, at Tremont and Boylston streets, Boston, for the purpose of widening Tremont street. This hotel is built of freestone and brick, 96 and 69 feet frontage. The Boylston street wall is supported on eight granite columns 12 feet high, 3 and 4 feet square. There is a basement and seven stories above the sidewalk. Height above tramways on which it was moved, 96 feet. Weight, 5,000 tons, exclusive of furniture, which was not disturbed during removal, as also were not the occupants of the stores on first floor and some of the rooms, the various pipe connections being kept up with flexible tubes. Careful experiments with models showed that if the lower part of the building was firmly braced, there was no danger of shifting in the parts above. The general arrangements consisted of heavy and substantial stone and brick foundations for iron rails and rollers, and the building was forced to its new position by fifty-six screws, 2 inches diameter, half inch pitch, operated by hand against timbers arranged to uniformly distribute the pressure against the building. Much care and ingenuity was displayed in the details of the arrangements and work. Two months and twenty days were occupied in preparation. The moving itself was begun on August 21, and finished on August 25, but the actual time of moving was but 13 hours and 40 minutes. The greatest speed was two inches in four minutes. The hotel moved about one-eighth of an inch at each quarter turn of the screws. The whole distance moved was 13 feet 10 inches. Four thousand three hundred and fifty-one days' labor was required for the work. The whole cost was about $30,000. This is the largest building that has ever been removed, although larger have been raised, which latter is a much simpler and less risky operation. The complete success of this undertaking is shown by the fact that cracks which existed in the walls prior to removal were not changed by the operation. Paper was pasted over them before commencing, that any change might be seen.

© 1881 SCIENTIFIC AMERICIAN, INC

ENGINEERING INVENTIONS.

A novel means for raising water from a well, cistern, or other receptacle, and conveying it to a distance and there discharging it, has been patented by Mr. James C. Richardson, of Boscobel, Wis. A wire track, inclining upwardly, is extended from the curb of the well, etc., to the place of discharge, and on this track a carriage, controlled by a rope and windlass, is arranged to run. Connected with this carriage by spring bolts is a bucket carrier, which, on reaching the well, is automatically released, to allow for the descent and filling of the bucket, after which the bucket carrier is raised by the rope and made to automatically engage with the carriage, that is drawn up the track till the bucket meets with a tilting stop, which causes the water to be discharged.

A firing and tamping device for torpedoes, more particularly intended for use in oil wells, but also applicable to wells and drills of various kinds, has been patented by Mr. James E. Gallagher, of Olean, N. Y. The invention consists of a weight designed to be dropped upon the head of the torpedo in the well or drill. This weight consists of a shell of fragile and insoluble material, filled with sand and provided with a solid point, which, striking the head of the torpedo, explodes the latter and causes the sand, that by the explosion and destruction of the shell of the weight is liberated, to be retained in a compact mass above the exploding torpedo, thus tamping the charge and causing it to act laterally.

Mr. James Hays Hagan, of Greenfield, Tenn., has patented an improvement in direct acting engines, in which three pistons are made to reciprocate in a single open-ended cylinder, and are connected with opposite cranks of a double crank shaft.

NEW TOOLS.

Among patents recently issued we find a few tools possessing some points of novelty. The pipe tongs, shown in Fig. 1, are the invention of Mr. N. Purdy, of Fall Brook, Pa. The improvement consists in linking the jaws of the tongs together at their outer ends, and linking one of the jaws permanently to the end of the handle or lever, the other jaw being adapted to be connected to the lever so as to grasp upon the pipe by means of a loop or similar device hinged or pivoted upon the end of the lever, and adapted to be placed over the end of the jaw.

The wrench shown in Fig. 2 has been patented by Mr. W. E. Wild, of Lead City, Dakota Territory. In this wrench the socket is provided with an interior adjustable section for adapting the socket to nuts of different sizes. The movable portion is provided with a rack which is engaged by a worm pivoted at the end of the handle.

An improved expanding mandrel that will hold the work firmly and truly, even under great pressure of the tool, is shown in Fig. 3. The invention consists of a longitudinally ribbed and split sleeve, which is driven into the work and on to a tapered mandrel. This improvement has been patented by Mr. J. A. Wilde, of Hudson, N. Y.

The improved lace cutter, shown in Fig. 4, is the invention of Mr. H. L. Chapman, of Marcellus, Mich. The invention consists in a slotted or split handle having the cutter fastened to its outer end in such a manner that the cutting edge crosses the slot diagonally. Through the slot an adjustable gauge for regulating the width of the lace passes, and can be locked in any desired position by means of the binding screw.

Fig. 5 represents an instrument for opening oysters, clams, and other shell-fish. It consists essentially in a sliding bar actuated by a lever handle and carrying an opening point or knife. An adjustable slotted standard is placed opposite the knife for supporting the oyster or clam. This invention has been patented by Mr. A. Ward, of Brooklyn, N. Y.

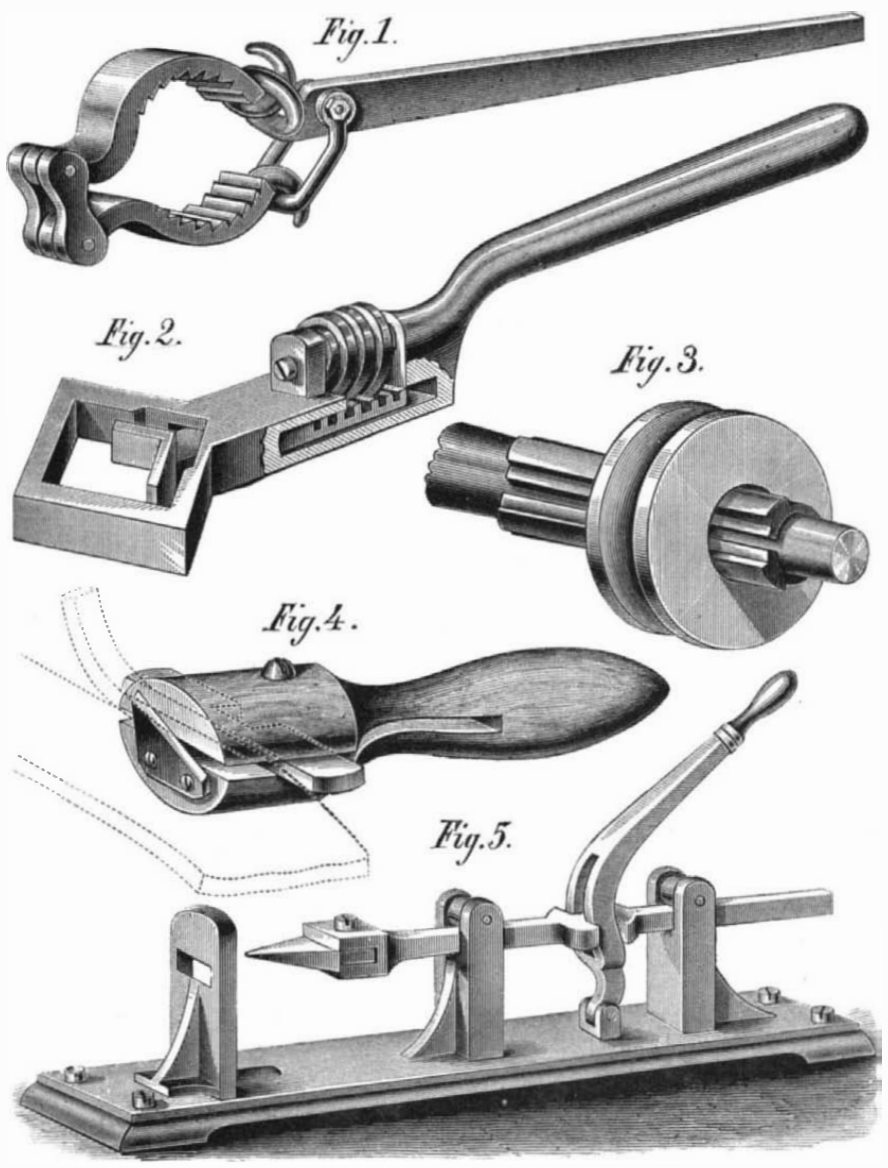


Fig. 1. Purdy's Pipe Tongs.—Fig. 2. Wild's Socket Wrench.—Fig. 3. Wilde's Expanding Mandrel.—Fig. 4. Chapman's Lace Cutter.—Fig. 5. Ward's Oyster Opener.

Fine Drilling.

Professor Edward C. Pickering, of Harvard College, says that in undertaking to measure the intensity of the light of the satellites of Mars he had occasion to need an extremely small hole. Among the artisans who essayed to furnish what was required was one who had succeeded in making a hole edgewise through an old-fashioned three cent piece, and another who had pierced a needle through from end to end. A hole about the twenty-five-hundredth part of an inch in diameter was finally secured.

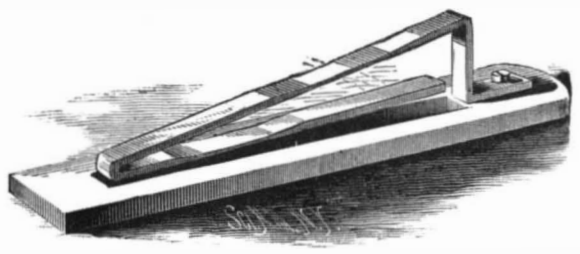
New Use for Buffalo Skins.

An inventor proposes to make machine gear wheels of raw buffalo hide by cementing and pressing together as many layers as are required for the breadth of the wheel. The blanks thus prepared are cut to form the teeth in the usual manner with suitable tools. The advantages claimed are, smooth and noiseless action at very high speeds and greater durability without lubrication.

NEW ORGAN REED.

The engraving shows a double-tongued reed for producing tones in unison or at an interval of an octave or more. The reed block has the usual slot.

The two tongues of this reed are formed of a single strip of metal bent double. One tongue is attached at one end to the reed block, and is raised above the block to give space for vibration of the other tongue beneath. The auxiliary tongue may be a separate piece of metal attached by a rivet.



DOWLING'S IMPROVED ORGAN REED.

The two tongues can be tuned to unison, or the upper reed may be tuned one or two octaves lower than the lower one. The combined tone is much more powerful than a single reed, and of superior quality.

This is the invention of Mr. John H. Dowling, of New Philadelphia, Ohio.

RECENT INVENTIONS.

An improved folding wardrobe bed has been patented by Mr. Ernest N. Doring, of New York city. This bed is so constructed that it will require less weight than heretofore to balance and keep in place. The invention consists in the combination, with the head boards and side boards, of curved friction bars pivoted at their lower ends and having their upper ends pressed forward by springs, whereby the pressure of the springs and curved bars against the ends of the sideboards will assist to keep the sideboards in any desired position.

Mr. George Derby, of New York city, has patented an improved mill burr which is in construction durable, and can be easily sharpened.

Mr. Thomas Aitken, of Pittston, Pa., has patented an improved coal drilling machine which is light, compact, and easily transportable, easy of adjustment, and will hold more securely in position for work.

An improvement in gong bells has been patented by Mr. Asa G. Golding, of New York city. The invention consists in constructing a gong bell with a handle attached to the bell, and having a neck, a shoulder, and a flange for suspending the bell detachably, a push rod having its lower end bent to one side, a bell clapper supported from a suspended frame and having a ball and a concaved disk at its upper end and a loose head at its lower end, and a standard having a base and having the horizontal upper end slotted to receive the bell handle.

A very compact and efficient hot water generator has been patented by Mr. William W. Goodwin, of Philadelphia, Pa., the same forming a portable heater for use in heating water for bath tubs, basins, etc., as required, or for use in connection with a boiler, for maintaining a supply of hot water, either as a separate apparatus or in connection with gas cooking stoves and ranges. The invention consists in a closely wound water coil inclosed within a double cylindrical casing arranged so that the heated air passes lengthwise of the coil in both directions, and through the outer casing to the escape flue, whereby the heat is utilized to the greatest extent and the water in the coil is rapidly heated. It also consists in a combination with such heater of a hot water reservoir, with which the coil of the generator is connected.

A very useful and complete machine for cleaning, polishing, and assorting nuts, such as pecan nuts, walnuts, etc., has been patented by Mr. Rudolph C. Koerber, of Austin, Texas. In this machine the nuts to be treated are first fed into a cylinder in which is deposited a quantity of gravel, broken stones, or pulverized glass, etc., and the cylinder rotated. By this operation the shells or particles of shells are broken from the nuts, which are thus cleaned. The nuts are then passed into a series of rotating reticulated cylinders, by which they are polished and separated from the gravel, etc., used in cleaning them, and are subsequently delivered down an inclined sieve to a box, from which they are raised by an elevator on to a vibrating sieve, which separates the larger from the smaller nuts. Any number of sieves, both stationary and vibrating, chutes, and receivers, are used to effect a thorough cleansing and extended assortment, according to size, of the nuts.

An improved balance scale has been patented by Mr. Arthur V. Abbott, of Brooklyn, N. Y. In this balance a beam is sustained by one or more flexible metallic strips rigidly attached to the beam and their support.

An improved steam pressure regulator has been patented by Mr. Howell A. Cummins, of Conneaut, Ohio. The invention consists, in combination with a valved steam pipe leading from a boiler, of a lever connected with the valve stem, and weighted at one end with a ball and at the other end with an empty tank or box nearly balanced by the ball. A box or tank containing mercury is connected with the steam pipe outlet and with the lever tank or box by tubular connections, so that when there is an excess of steam pressure in the steam pipe outlet, steam therefrom will enter the mercury tank and force a portion of its contents into the lever tank, thereby drawing down the long end of the lever and closing or partly closing the valve and correspondingly cutting off the steam.

Mr. Ernest W. Noyes, of Bay City, Mich., has patented a spring attachment or boot to be attached to the knees of horses for giving style to the action and gait of the animal, and for increasing his speed, and which at the same time tends to assist the horse in lifting his feet from the ground.

An improved currycomb, patented by Mr. Carey A. Manker, of Red Oak, Iowa, consists in a novel construction of the comb and its handle and the frame and handle of the brush, and a novel mode of connecting the comb and brush, whereby they may be used either alternately or simultaneously, or may be disconnected so as to be used separately.

Mr. Eleazer Ainsworth, of Wilmington, Del., has patented an improved boiler and pipe covering, formed of a layer composed of a mixture of morocco shavings and clay, and two layers composed of a mixture of paper-mill refuse or wood-pulp mill refuse and clay and lime, the layers being held by the wire wrapping.

Mr. Edward B. Ives, of West Point, N.Y., has patented an improved photographic plate holder. The invention consists in a novel mode of constructing the holder by attaching together a number of layers of material.

A hand sawing machine, for cutting trees into logs or lengths, has been patented by Mr. Martin Kurtzeman, of Shelby, Ohio. In this machine the saw is operated by a vertically vibrating hand lever, which is connected with the one arm of a bent lever, the other arm of which is provided with a toothed segment. This segment, which works on a lower fulcrum in the frame, gears with a pinion above, the shaft of which operates a crank arm or lever that is pivoted at its lower end to a saw arm or handle. The forward end of this saw arm is slotted to receive the rear end of the saw blade, which is pivoted to the saw arm. The hand lever works up and down between adjustable rubber blocks, which relieve the lever of jar and start it on its return movement.

© 1881 SCIENTIFIC AMERICIAN, INC

OUR GRAIN CROP AND ITS COMMERCIAL IMPORTANCE.

[*Continued from first page.*]

decade; in the preceding decades the gain was 66 and 60 per cent. Seven-tenths of the entire crop last year was produced in Illinois, Indiana, Ohio, Michigan, Minnesota, Iowa, California, Missouri, and Wisconsin. The products of these States were, in round numbers: Illinois, 51,000,000 bushels; Indiana, 47,000,000; Ohio, 46,000,000; Michigan, 35,500,000; Iowa, 31,000,000; California, 29,000,000; Missouri and Wisconsin, each 25,000,000. Pennsylvania followed with 19,500,000 bushels; Kansas, 17,000,000; Nebraska, 14,000,000; New York and Kentucky, each 11,500,000. The home consumption of wheat is about 300,000,000 bushels.

The great corn-growing States are: Illinois, 326,000,000 bushels; Iowa, 275,000,000; Mississippi, 200,000,000; Indiana, 115,000,000; Ohio, 112,000,000; Kansas, 106,000,000; Kentucky, 73,000,000; Nebraska, 66,000,000; Tennessee, 63,000,000. Far below in the scale of productions are the following, the figures standing for millions of bushels: Pennsylvania, 46; Wisconsin, 34: Michigan, 32; Virginia, 29; Texas, 29; North Carolina, 28; New York, 26; Alabama, 25½; Arkansas, 24; Georgia, 23; Mississippi, 21.

The oat crop comes mainly from Illinois, 63,000,000 bushels; Iowa, 50,500,000; New York, 37,500,000; Pennsylvania, 34,000,000; Wisconsin, 33,000,000; Ohio, 28,500,000; Minnesota, 23,500,000; Missouri, 21,000,000; Indiana, 15,500,000. Four-tenths of the area of this crop and nearly half the total product are accredited to the first four States named.

Of the barley crop California and New York produce nearly one-half, and Wisconsin, Iowa, and Minnesota yield most of the other half. About half the rye crop comes from Pennsylvania, Illinois, and New York. Of the buckwheat crop (about 12,000,000 bushels) two-thirds are produced by New York and Pennsylvania.

The enormous and wonderfully rapid increase in our grain crops is attributable to several causes. Primarily we have the invention and improvement of agricultural machinery, by which the cultivation of the great West has been made possible. Next we have the vast extension and improvement of our railway and water lines, making possible the profitable transportation of the large surplus to Eastern and foreign markets. With this extension of means has come an important lowering of freight charges, which has made it possible to place American grain in the markets of Europe at prices at which it can compete successfully with European grain, especially that from Russia, Hungary, Austria, and Germany.

Of course the vast immigration of farmers who have swarmed into the Northwest, a full regiment a day for every day in the year, is an element of the problem of no mean significance; but their labor has been largely invited and made profitable by the cheapening of the transportation of their crops to the East and to Europe.

Ten years ago it was the belief of railroad men that grain could not be carried from Chicago to New York for less than 24 cents a bushel. The rate has since been lowered to 20 cents, and for special rates, it is said, on good authority, to half that sum. The nominal rate at this time is 17 cents. During the same period the cost of water carriage has been correspondingly reduced. The lowest estimate that we have seen of the actual cost of bringing wheat from Chicago to Buffalo by steam barge is $2.85 a hundred bushels; from Buffalo to New York by canal and river, $5.70; making the cost from Chicago to New York by water (all charges included), $8\frac{55}{100}$ cents a bushel.

Ten years ago it cost nearly as much to get a bushel of grain from Buffalo to New York as it now does to carry it from Chicago to Liverpool. The influence of a reduction of a cent a bushel in transportation charges would be incredible if we did not know how narrow is the margin of profit in the handling of great staples. The reduction of one cent in the Erie Canal tolls was followed by an increase in grain carriage from 29,000,000 bushels to 69,000,000 of bushels. In a recent Legislative inquiry a prominent grain merchant expressed the belief that the abolition of the remaining one cent toll would increase the flow of grain through the canal to 150,000,000 bushels a year.

Something over half of the entire export grain trade of the country is done at this port, where the elevators and great warehouses have a storing capacity of nearly twenty-five million bushels. A very large part of the grain passing through the city, however, is loaded directly from the canal boats into the ocean steamers, as shown in our illustration. Commonly the loading and unloading go on together, a floating elevator hauling alongside and pouring in the grain as fast as the outgoing freight is removed. Usually the canal boats carry from five to seven thousand bushels or more, four of them sufficing to load a grain ship, and eight to ten a large steamer. The largest cargo ever brought through the canal was recently reported; it was 8,500 bushels. The largest grain steamer will carry 150,000 bushels; from 80,000 to 90,000 bushels is a large cargo.

To carry our entire grain crop would require from thirty to fifty thousand large steamers; or something like half a million canal boats, or a train of freight cars over thirty thousand miles long! To carry away as wheat our exports of wheat and flour would require five thousand vessels carrying the average cargo of 30,000 bushels each. It is only by figures like these that one can make any approach to a definite idea of the magnitude of the grain trade, or its enormous influence upon the world's commerce.

Though not intended specially for the grain trade, the huge steamer, the City of Rome, shown at the bottom of our first page illustration, will, no doubt, prove an important factor in its future development. This steamer ranks next to the Great Eastern in size, and is the largest vessel in the merchant service. Her dimensions are as follows:

Length of keel, 546 feet; length over all, 590 feet; breadth of beam, 52 feet; depth of hold, 38 feet 9 inches; and depth from top of deck house to keel, 52 feet. Her tonnage is 8,300, being over four-fifths that of the Great Eastern. The leading particulars of the engines are as follows:

There are three high pressure cylinders 43 inches in diameter, and three low pressure cylinders 86 inches in diameter, and 6 feet stroke. The diameter of the crank shaft is 25 inches, and of the crank pins, 26 inches. The length of the main bearings is 33½ inches, and of the crank pins 28 inches. The crank shaft, as built up complete, will weigh 64 tons; had it been made of iron, and solid, the weight would have been 73 tons. The propeller shafting is 24 inches in diameter, and the hole through it 14 inches in diameter. The thrust shaft has thirteen collars 39½ inches in diameter, giving a surface of 6,000 square inches. This piece of shafting weighs 17 tons. The propeller shaft is 25 inches in diameter and 30½ feet long, and weighs 18 tons. The engine bed plate weighs 100 tons. The cooling surface of the condensers is 17,000 square feet, equal to nearly 17 miles 360 yards of tubing.

There are two air pumps 39 inches in diameter, and 3 feet stroke; these pumps, and the feed and bilge pumps, being worked by levers attached to the aft and forward engines. There will also be a large centrifugal pumping engine, which can either be used for pumping heavy leaks, or to discharge through the condenser. There will also be three auxiliary pumping engines, for feeding the boilers, for bilge pumping, and for deck purposes. Steam will be supplied by eight cylindrical tubular boilers, fired from both ends. Each boiler is 14 feet mean diameter and 19 feet long, with a steam receiver 13 feet long and 4 feet in diameter, and has six furnaces 3 feet 9 inches in diameter, three at each end, so that there are forty-eight furnaces in all. The fire bars are 6 feet long, giving a grate surface of 1,080 square feet. The shell plates of the boilers, supplied by Sir John Brown & Co., are 24 feet 8 inches long, 4 feet 4½ inches wide, and 1¼ inches thick, and weigh nearly 2½ tons each; all the holes are drilled. The internal parts are of Bowling iron, and each furnace has its own separate combustion chamber. These boilers are constructed for a working pressure of 90 pounds per square inch. The engines are intended to work constantly at 8,000 indicated horse power, although they are capable of developing 10,000 indicated horse power.

Though built for a speed of over 17 knots an hour, or over 400 miles a day, the maiden trip of the great steamer was a slow one. Three stoppages of importance were necessary during the voyage, owing to the machinery. On the first night out from Queenstown the journals grew too hot to continue, and a two hours' stop was necessitated. On the following day the reversing gear of the engine got out of order, and for sixteen hours the monster vessel lay to in a rough sea, rolling heavily. Afterward the steam steering gear became deranged, and two hours more were lost while the engineers worked at it. Stoppages excluded, the voyage across the Atlantic was made in eight days and twenty-two hours.

INVENTIONS.

An improvement in boiler furnaces, having for its object the complete combustion of the fuel and gases in the fire boxes of steam boilers, evaporators, etc., has been patented by Mr. John Mailer, of San Francisco, Cal. The door of the furnace has a series of air passages through it, and the lining of the door is also made with a series of perforations, in which are inserted short stout metal tubes that project inward toward the door front. These tubes become highly heated and elevate the temperature of the air passing through the door. The bridge wall of the furnace is likewise provided with several rows of perforations, through which the smoke and gaseous products of combustion are restricted in their passage from the fire chamber to the combustion chamber.

Mr. John H. Blake, of Batavia, N. Y., has patented an improved cut-off valve gear. The invention consists of two slide valves, one at each end of the cylinder, each having a separate steam chest, into which steam is admitted throughout the whole stroke of the engine, the point of cut-off being regulated by rotary valves that are placed in supplemental steam chests over each slide valve; and it consists, further, of a hydraulic cylinder designed to be operated by water under pressure, provided with suitable valve and piston, which cylinder forms the connection between the governor and rotary or cut-off valves, and facilitates and regulates the action of the latter. The mechanism for operating the valves and the rotary valves are of peculiar construction, and among the advantages attained by this system of governing are the retention of the cut-off at any point it may have assumed, the slight strain thrown upon the governor, great sensitiveness of the latter, and nicety of adjustment to any point of cut-off desired, also the prompt and decided action of the cut-off devices.

Mr. Adam R. Reese, of Phillipsburg, N. J., has patented a machine for quarrying slate and other rock. The object of this invention is to avoid that excessive waste of the rock, labor, and expense which is attendant upon the ordinary methods of quarrying, by the use of an improved machine for sawing and cutting the rock *in situ*. This machine is provided with a reciprocating traveling carriage having rotary saws or cutters for effecting the cut of the rock. The carriage is supported on a frame furnished with vertical screw threaded and sharp pointed legs for the purpose of adjusting the frame to different inclinations or levels. Screw adjustments also are provided for shallow or deep cutting by the saws. The machine is organized for cutting parallel channels in the slate or rock, and the saw teeth cut upward, so that the power applied to the cutting shall operate to hold the machine more firmly down in position. An engine is mounted on the frame for operating the mechanism which transmits the necessary motion to the saws, but it is designed that the motive agent, which may be steam, compressed air, or gas, shall be furnished by suitable metal pipes and flexible tubes from a source which is independent of the machine.

Mr. William Crye, of Walla Walla, Washington Territory, has patented an improvement in middlings purifiers. The object of this invention is to keep free and clean the screens of middlings purifiers used in the process of manufacturing flour. To this end, the screen of the purifier has combined with it a reciprocating brush frame, the brushes of which act upon the underside of the screen. A rotating double-threaded rod, working in a double-threaded nut, gives the necessary reciprocating action to the brush frame, the nut being tilted at the end of each stroke for the purpose of engaging and disengaging alternately with the right and left hand threads on the rod.

Mr. Richard H. Atwell, of Baltimore, Md., has patented a spray motor, which is not restricted to a mere construction of parts, but includes a valuable principle of action. The invention consists in a method of increasing the effective power of rotary jet motors by commingling a gaseous and liquid medium to form a spray, and directing this spray against the periphery of a wheel or moving interior portion of the motor. Various kinds of gas may be used in concert with water to form the spray, and either the gas or liquid be energized. In either case it is claimed that a greatly increased result is obtained over or as compared with the use of air or gas alone or a liquid alone as the impelling agent. The invention also consists in certain constructions of different parts of a rotary jet motor for advantageously carrying the above principle into effect, the same including an inlet for a liquid medium and an inlet for a gaseous medium having a confluence at or before the point of impact against the wheel; also a wheel against which the spray acts formed of a disk with angular buckets projecting from the side of the same.

Mr. James D. McAnally, of Waterloo, Ind., has patented an improved harness catch and cockeye for whiffletrees, etc. This invention, which is equally adapted for use upon neck yokes, bridle bits, water hooks, and in fact upon all parts of a harness where catches are desired, consists in a ferrule having an outwardly or endwardly opening catch, clipped away on its under side, in combination with a vertically inserted cockeye, capable of ready engagement and disengagement, and having its pintle protected from dust.

The Longevity of the Ancients.

Can man reach and pass the age of a hundred years? is a question concerning which physiologists have different opinions. Buffon was the first one in France to raise the question of the extreme limit of human life. In his opinion, man, becoming adult at sixteen, ought to live to six times that age, or to ninety-six years. Having been called upon to account for the phenomenal ages attributed by the Bible to the patriarchs, he risked the following as an explanation: "Before the flood the earth was less solid, less compact than it is now. The law of gravitation had acted for only a little time; the productions of the globe had less consistency, and the body of man, being more supple, was more susceptible of extension. Being able to grow for a longer time, it should, in consequence, live for a longer time than now."

The German Heusler has suggested on the same point that the ancients did not divide time as we do. Previous to the age of Abraham the year, among some people of the East, was only three months, or a season; so that they had a year of spring, one of summer, one of fall, and one of winter. The year was extended so as to consist of eight months after Abraham, and of twelve months after Joseph. Voltaire rejected the longevity assigned to the patriarchs of the Bible, but accepted without question the stories of the great ages attained by some men in India, where, he says, "it is not rare to see old men of one hundred and twenty years." The eminent French physiologist, Flourens, fixing the complete development of man at twenty years, teaches that he should live five times as long as it takes him to become an adult. According to this author the moment of a completed development may be recognized by the fact of the junction of the bones with their apophyses. This junction takes place in horses at five years, and the horse does not live beyond twenty-five years; with the ox, at four years, and it does not live over twenty years; with the cat at eighteen months, and that animal rarely lives over ten years. With man it is effected at twenty years, and he only exceptionally lives beyond one hundred years. The same physiologist admits, however, that human life may be exceptionally prolonged under certain conditions of comfort, sobriety, freedom from care regularity of habits, and observance of the rules of hygiene, and he terminates his interesting study of the last point ("De la Longévité Humaine") with the aphorism, "Man kills himself rather than dies."—*M. De Solaville, Popular Science Monthly.*

© 1881 SCIENTIFIC AMERICIAN, INC

Correspondence.

Small Motor Wanted.

To the Editor of the Scientific American:

It is a marvel that no one has as yet invented a moderately sized machine for working punkas in India. Each room in three-fourths of the stations of this country has its punka worked by a cooly, and the annual cost of these men, whose pay varies from three to six rupees ($1.50 to $3) a month, is enormous. In large establishments, such as barracks, of course, very many are required, but in private houses, too, they may often be counted by the dozen.

Not only are they very expensive, but they are at the same time, in nine cases out of ten, very useless, and many are the sleepless nights passed by the hapless European, due solely to the cooly, whom it is impossible to keep awake. The moment the punka stops, not only does the heat become oppressive, but bloodthirsty mosquitoes in myriads swoop down on the unfortunate victim. He then, who would invent a simple machine to work a punka that could be regulated by the owner himself and render him independent of the drowsy cooly, would not only confer an unspeakable blessing on the Anglo-Indian community, but would also make an enormous fortune commercially, for once let their value be known they could not be made quickly enough.

In some barracks and hospitals there are already punkas worked by steam, but it is not these we want; it is a common, simple machine that could, if necessary, be moved from room to room. As the resistance offered by a small punka is very slight, it would require no very powerful mechanical contrivance to work one for eight hours, say, before it required fresh adjustment.

If you will publish this far and wide through your valuable columns, it may lead to some invention that will at once secure a fortune to the inventor and prove an inestimable boon to the sufferers who are dependent upon drowsy, frail, human machines for their comfort and repose.

F. W. MAJOR.

Calcutta, September 5, 1881.

REMARKS.—A machine such as our correspondent describes is wanted almost everywhere. Its invention would be of great value. We will offer a few suggestions to those who may wish to study the subject. The punka referred to consists of a large fan suspended from the ceiling of the apartment and operated by a rod which the attendant pushes back and forth. To work a punka so as to produce a sensible effect in the hot climate of Calcutta requires the exercise of a force equal to about one-tenth of a horse power. To the majority of people it looks as if this small force might be easily applied by a coiled spring or a weight. Let us try the weight. How large a one is needed? For a full horse power a weight of 33,000 pounds descending one foot in a minute is required. To drive a punka, therefore, one-tenth of the above, that is, a weight of 3,300 pounds descending one foot, will do the business for one minute. To make it run ten minutes the weight must be wound up ten feet high, or six winds an hour. In the household so weighty a machine would be cumbersome. Springs would occupy less space, but they would still require to be pretty heavy and must be frequently wound. If our correspondent has gas he can readily obtain a small gas motor which, on a consumption of six cubic feet per hour, will drive one punka. Next to that probably the best motor would be water. A tank filled with water eleven feet square and same depth, placed twenty feet above ground, if allowed to discharge its contents in a suitable manner upon a small wheel at the ground, would drive a punka for eight hours. The water must then be pumped up again into the tank. There is no royal way to realize mechanical power. It is simply the lifting of a dead weight, either by turning a wheel or working a pump, or carrying water upstairs in buckets, or using the power of the wind, running streams, or a combustion of fuel.

The Influence of Atmospheric Pressure on Earth Currents and Mine Gases.

To the Editor of the Scientific American:

In the SCIENTIFIC AMERICAN of October 22, there was an article referring to some observations, which, if correct, establish the influence of atmospheric pressure on the flow of springs. This recalled to me a fact observed years ago, and which strikingly exhibits a consequence of an increase or decrease of this pressure that we do not usually think of.

I used to live in Switzerland. Years ago a gentleman of my acquaintance attempted to dig a well. The ground proved to be sand and gravel to a depth of 93 feet, when at last water was found. The well was walled in in the usual fashion and a force pump set in. But soon the water disappeared. The well was deepened again, until at a depth of 115 feet water was reached again. But as the nature of the soil continued the same this water also soon disappeared, and the well was therefore given up and covered over. Soon after a remarkable phenomenon was observed. At certain times a violent wind would blow from the well, so strong as to blow a handful of straw held over it eight or ten feet in the air. At other times the current would run in the opposite direction. Soon it was observed that a change of direction in the current of air would precede a change of weather: an upward current came to mean rain, a downward direction fair weather. The well was consulted a good deal by the neighboring farmers, especially in haying and harvest time, and proved a very sensitive barometer. Of course the explanation suggested itself at once. A decrease in the pressure of the atmosphere would release a great quantity of air pent up under the previous higher pressure in the extremely porous soil, for which this well proved a convenient drain. The opposite would take place under an increasing pressure, *i. e.*, during a rise of the barometer.

About a year ago or more, there appeared in the *Nineteenth Century* an article by Mr. Plimsoll, discussing the possibility of preventing explosions in the coal mines, an article which elicited several others on the same subject. In Mr. Plimsoll's article the well known fact was alluded to that during a low pressure of the atmosphere the air in the mines was much worse than when the barometer stood high. The cause of this is usually assumed to be a less free circulation of the air. Would not the above mentioned observation on the well suggest another cause—an enormously increased discharge of carbureted hydrogen gases under a lower atmospheric pressure?

The same thing must take place over very large areas every time when the barometer indicates low atmospheric pressure. A good deal of the air escaping from the ground must be miasmatic in its nature. Pettenkofer's investigations leave no doubt of this. Would not this account also, in some degree, for the rather languid feeling that is very prevalent whenever a low barometer prevails over a large area for any length of time? J. J. SCHOBINGER.

Chicago, October, 1881.

The Deadly Fly in Texas.

To the Editor of the Scientific American:

In your paper dated September 24, page 196, I was much interested in the report of a disease produced by a "deadly fly," the *Calliphora anthropophaga*, found by Conil in the Argentine Republic; and so similar in many particulars is the fly, the worm (larvæ), and the disease produced by it, as well also as its favorite habitat, to the similar, if not identical fly, the stock pest of our summer and fall months here, that I may be excused for sending you a hastily written report of a case which occurred in my practice, selected from among others treated only on account of a hidden pathological condition which it seems possible may have been revealed through the agency of the worm.

At the time the article was written no volume of reference was at hand, by which I could give the systematic name, and hence reported it from an unscientific standpoint, using the vulgar name, the one by which it is known here, "screw worm."

From the very great resemblance of the illustration in your paper to the Texas "screw worm" and also the parent fly, I am inclined to think they are identical.

My own impression is they are deposited prehatched, as they attain their full growth and size by the fourth or fifth day, which is probably three-eighths to half an inch in length instead of *five*-eighths, as mentioned in the report.

It is singular that they seem confined to the trans-Mississippi, and, I believe, south of the 34th or 35th parallel.

Accompanying this note I forward you the report mentioned. T. H. CLARK, M.D.

Reagan, Falls Co., Texas, October, 1881.

We have received the report mentioned by Dr. Clark. The account of the case that occurred in his practice in 1878 is very interesting, and corresponds closely with the description he refers to in our paper of September 24, concerning the Argentine fly. We think that there have been instances of loss of life in this city from the bites of a fly that hovers about the hides that come from Buenos Ayres.

Dr. Clark's report was published in the *Virginia Medical Monthly* for June, 1879.

Painting of Cement and Plaster.

Much difference of opinion prevails respecting the question of painting Portland cement, and we have seen work painted a few weeks after the cement has set, which has stood well. There is one point which has a great deal to do with the question of successful painting, namely, the absorbency and dryness of the brickwork itself. Many new walls, saturated with moisture, are cemented, and in this condition no paint can possibly stand if laid on too soon. It is a good and safe rule to enforce that Portland cement work should not be painted within a year of its completion, to allow it to dry thoroughly; but we are safe in saying the majority of new fronts are painted before they have been finished three months. A very desirable precaution seems to be to coat the work with linseed oil first.

The painting of plaster work requires the same care, and the lime works out in small bubbles, destroying the paint. In painting plaster, white lead and linseed oil, with a little drier, is recommended by one authority. This coat should be of the consistence of thin cream, so that the oil is absorbed into the plaster in a few hours. In a day or two another thicker coat may be applied, and a third a few days after rather thicker, followed by the finishing coat. Four coats are not too much for good work. By the absorption of the oil into the plaster the surface becomes hardened, and may be washed. Another method to facilitate this absorption is followed by painters, which is to give the plaster two or three coats of boiling linseed oil, and then to apply the other coats of paint. We are inclined to think the application of the oil before the paint a better plan, to insure a thorough saturation of the material. The color of Portland cement, and the uneven tints it sometimes assumes, is the main reason why painting it is resorted to. For this reason we think it may be worth the attention of manufacturers to turn their consideration to the subject, and those using cement as a stucco might also prevent a blotchy and uneven tint by attending to the preparation of the wall and the sand they use with the cement.—*Building News.*

AGRICULTURAL INVENTIONS.

Mr. Ashley E. Armstrong, of East Claridon, Ohio, has patented an improved conductor tube for grain drills and fertilizer distributers, so constructed that the plows can adjust themselves to uneven land, and can rise to pass obstructions without disarranging the tubes or interfering with their proper operation.

An improved stalk rake has been patented by Mr. Henry Grebe, of Omaha, Neb. This rake is intended for gathering cornstalks and other stalks and rubbish into windrows, to facilitate the preparation and cultivation of the land.

An improved sulky harrow has been patented by William Hannum, of Mount Gilead, Ohio. The invention consists of a harrow composed of two wings or sections hinged to each other, provided with guide rods and suspended from the axle, and three independent shafts journaled in standards secured to the axle, and provided with levers and eccentrics carrying chains secured at their lower ends to the harrow sections, near their outer and inner edges, whereby the central portion of the harrow or either harrow section can be raised or lowered independently of the other section to avoid obstructions, or both sections can be raised or lowered when desired.

An improved cornstalk loader has been patented by Mr. Peter C. Schlechtmann, of Arlington, Wis. This invention consists of a derrick of peculiar construction operated by a long lever and cords and pulleys.

A machine for splitting and breaking cornstalks has been patented by Messrs. Jacob Behringer, of Bowmansdale, William Stouffer, of Dillsburg, and Joseph R. Potts, of Mechanicsburg, Pa. In this machine the cornstalks to be operated on are passed in between a pair of feed rollers, to and over a stationary breaking bar, where they are first split by the action of a revolving winged cylinder of knives, and subsequently broken down across the edge of the bar by the wings or arms of the cylinder. The split and broken cornstalks can be handled by a fork with as much ease as hay and straw; they form better feed for cattle than when whole or merely cut crosswise; and the refuse stalks will be much sooner converted into manure.

A pulverizing attachment for plows has been patented by Mr. Tapley B. Maddux, of Denton, Texas. The object of this invention is to pulverize furrow slices as they are turned by plows; and it is particularly designed to lessen the draught in such devices by arranging the cutters at the top of the mould board in such manner as to offer but little resistance to the passage of the furrow slice. To this end the curved mould board of the plow has a bar secured to its upper curved edge, on which bar are fastened a series of cutters arranged to project upward and inclined or curved to the rearward, also formed with shoulders which rest upon the mould board. The cutters are sufficiently long to reach through the furrow slice.

Mr. Armand Richard, of Grand Coteau, La., has patented an improvement in plows, in which provision is made for adjusting the blade of the plow, as it wears, by loosening a clamp bolt and removing the teeth of a clamp from notches in a flange with which they engage, after which the blade may be set further forward. The clamp bolt does not pass through the cutting blade, consequently the latter is not weakened by a hole for the bolt.

The Panama Canal.—Work Done.

The president of the American Branch of the (De Lesseps) Panama Canal Company has issued a statement of the condition of the work. Notwithstanding the obstacles encountered in the luxuriant vegetation and the thick forests, there has been opened and recorded transversely to the axis of the canal over 200 kilometers of paths, and also a passage from 20 to 30 meters has been made from one end of the Isthmus to the other, according to the proposed lines of the Canal Commission. For meteorological studies, to which especial attention has been given, four stations have been established —at Colon, Gamboa, La Boca del Rio Grande, and Naos Island. Geological surveys have been made and are now in progress. It has been ascertained that between Colon and Lion Hill the canal will not encounter any rocks. At the present time two steam sounding apparatus are being put up similar to those at Colon. At this station the samples brought up by the spoons have given an exact structure of the soil. It is shown to be a succession of layers of clay, representing the degradations of a greenish pyroxenic rock, which through its gradual degradations and decomposition has produced this formation. At other places the ground, bored to a depth of 25 meters, has revealed nearly every way, instead of successive formations methodically arranged, a chain of derived rocks growing softer and softer. The thickness of the mellow soil is quite remarkable, and, in a word, the soundings have given results beyond expectation on the whole line of the canal.

Work on the canal has been commenced. The company now have 200 cars, 12 locomotives, 2 pontons, 2 steam cranes, 18 flatboats, 2 dredges with change pieces, ribbon saws, rails, etc., a part of which is already at Colon and the remainder is on the way. The storehouses at Colon cover an area of 1,400 meters, and are full. Five barges and two steamboats are plying upon the Chagres River. Another steamboat at Panama is used for hydrographic surveys of the bay.

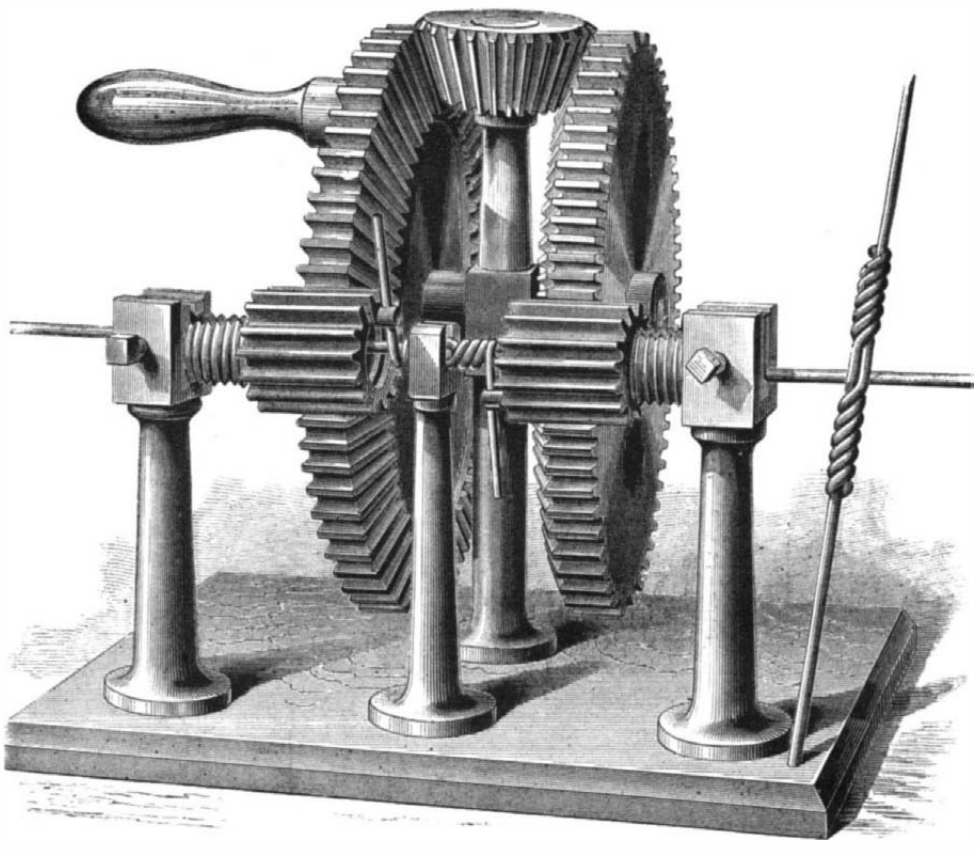
© 1881 SCIENTIFIC AMERICIAN, INC

TELEGRAPH WIRE JOINTER.

The engraving shows a simple and compact machine for quickly joining the ends of telegraph wires. Two standards fixed opposite each other on the base support two horizontal screws extending inward toward each other. A groove, extending the whole length of each screw, is cut through its upper face as far as the axis for receiving the ends of the wires that are to be jointed. Upon each screw there is a pinion also slotted to admit the wire and provided with a stud on its inner end. These two pinions are engaged by two spur wheels turning loosely on the same axis and having beveled cogs formed on their adjoining faces.

The beveled portions of these wheels mesh into a bevel wheel supported on a bearing between them, so that when one wheel is revolved in one direction the other will move in the reverse direction. This results in turning the pinions in opposite directions and twisting the ends of the wire one around the other in opposite directions.

The wires to be jointed have their extremities bent at right angles. They are then laid in the slots of the screws through the slots of the pinions, which, acting as nuts, are run in opposite directions toward the standard. The bent end of each of the wires takes against the stud which projects from the inner end of the opposite pinion, and so that the wires overlap each other within a slot in the top of the standard placed between the two screws. The drive wheels are then turned by means of the handle, revolving the pinions in opposite directions, so that they move from each other. By this means the ends of the wires are twisted about each other in exact imitation of hand-jointing, as shown in the view of the section resting on the machine. This invention has been patented by Messrs. F. and J. A. Crich, the former of Johnstown, Pa., the latter of Naugatuck, Conn.

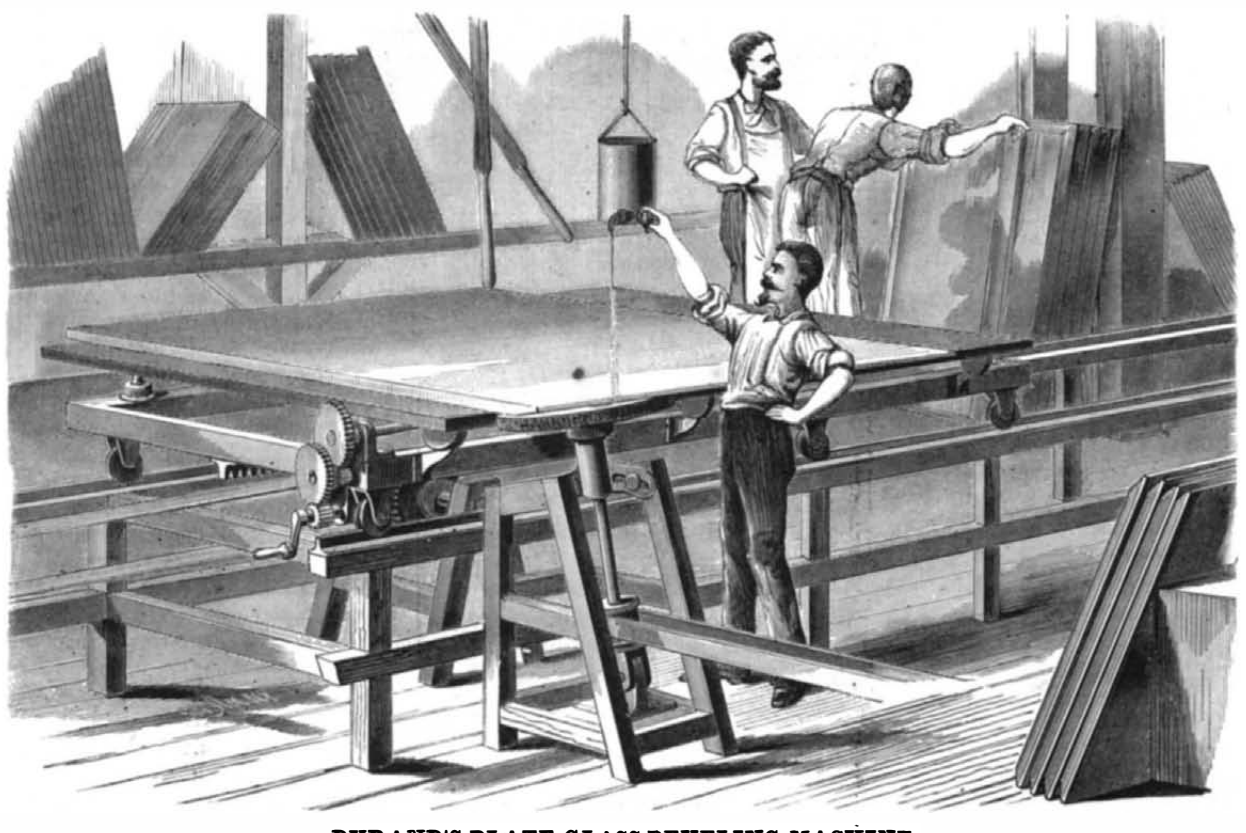


TELEGRAPH WIRE JOINTER.

PLATE-GLASS BEVELING MACHINE.

The engraving represents an improved machine for beveling and polishing the edges of plate glass. It is capable of making a bevel of any width or inclination, and it does it very rapidly and perfectly. The table upon which the glass plate to be beveled is placed, is supported upon a series of eccentric wheels mounted on a shaft passing along that edge of the table adjoining the grinding wheel. These eccentrics can be rotated gradually by means of geared wheels so as to raise or lower that edge of the table; the opposite edge of the table resting upon ball-and-socket joints. The grinding wheel of iron is mounted on a shaft which rests in a swiveled bearing which permits of the inclination of the shaft to the desired bevel.

The table on which the glass plate rests is movable lengthwise along a track which is double the length of the table. After placing the glass plate upon the table, the eccentric shaft is rotated until the longest radius of the eccentrics extend upward. The grinding wheel shaft is inclined more or less until the inclination of the wheel is the same as the angle of the desired bevel. If a very flat bevel is desired, the grinding wheel and its shaft are but slightly inclined; but if a steeper bevel is required, the inclination of the grinding wheel will be increased. The grinding-wheel having been adjusted, the power is applied, and the table-moving mechanism is made so that the motion of the table is reversed at the end of each trip of the table. The edge of the glass plate is drawn over the grinding disk, to which is applied the abrading or polishing material. After a certain time the edge of the plate will have been ground off to such an extent that the grinding wheel cannot attack or abrade it; the eccentric shaft is then rotated more or less, as may be necessary, adjusting the front edge of the table and of the glass plate resting on it, as may be required. This invention was recently patented by Mr. Dominique Durand, of Mamaroneck, N. Y.



DURAND'S PLATE-GLASS BEVELING MACHINE.

The Nature of Coal.

Messrs. C. F. Cross and E. J. Bevan have been carrying on a chemical research into the nature and method of the formation of coal. They treated jute fiber with sulphuric acid (sp. gr. 1·65) at 70°, and obtained an insoluble, black, spongy substance. This formation is in some way based on cellulose, as a similar compound may be formed from pure cellulose and dextrin. The production of this spongy substance is usually of a destructive character, attended with the evolution of carbonic acid and the formation of acetic acid. A study of the chemical properties of the substance has led the above-named observers to the conclusion that lignin is derived from cellulose by chemical modification. A remarkable circumstance in connection with the physical nature of the black substance in question is that it dries to a hard mass, resembling cannel coal, with which it has been compared, and similar results of chlorination and nitration have been obtained. This evidence goes in further support of the opinion that coal is not carbonaceous in any more special sense than alcohol, but is rather, as supposed by Balzer, composed of a series of C, O, H, N bodies, which are genetically if not homologously related. It is suggested that cellulose, lignin, peat, lignite, coal, and anthracite are terms of an infinite series specialized by the conditions of their formation.—*Jour. of Gas Lighting.*

NEW INVENTIONS.

An improved telegraph key has been patented by Mr. Addison E. Peterman, of Handsborough, Miss. This invention consists in a spring lever key of novel construction and arrangement, the object being to obtain uniform tension with ease in working, and to avoid the objections that exist to the use of a lever and separate spring.

Mr. George Andrews, of Bellows Falls, Vt., has patented an improved and durable belt to be used on all machines that employ narrow or round belts. The invention consists of a belt formed of a core of some strong material, preferably catgut, wound with strong wire.

Mr. Nicholas B. Dennys, of Singapore, Straits Settlements, British India, has patented an improved oil can tip. The object of this invention is to prevent waste from oil cans in oiling machinery; and the invention consists in a spring actuated tip applied to an oil can tube for closing the outlet.

An improvement in the manufacture of paper, patented by Messrs. Nicholas G. Richardson, of Tyaquin Monivea, County of Galway, and William Smith, of Golden Bridge Mills, county of Dublin, Ireland, consists in the employment of a new vegetable substance combined with other substances now used in the manufacture; or such vegetable substance can be used alone to make from it, by the aid of the usual appliances or apparatus, a pulp from which the paper is made. The vegetable substance used is *Molinea cærulea*, otherwise *Melica cærulea*, commonly known as "melic grass." This grass is converted into pulp or half-stuff, and the same can be, by the usual appliances or apparatus, converted into paper, or such substance as may be combined with any of the substances usually employed in the manufacture of paper.

Mr. Henry G. Dennis, of New Bedford, Mass., has patented an improved bell joint for coupling pipes. The invention consists in a rabbeted collar mounted on the end of a pipe and resting against an annular bead near the end of the same, which pipe is swaged out to receive the contracted end of the other pipe, upon which molten lead is poured through an aperture in the top of the collar to fill the space between the inner surface of the collar and the pipes, a clay roll having been previously placed against the open end of the collar.

An improved process of distilling alcohol has been patented by Mr. Charles W. Lawrence, of New York city. The process consists in charging the still with spirit-producing material and powdered charcoal in about the proportions set forth, then stirring and heating the mass by steam, as shown, whereby the operations of distilling and rectifying are accomplished at one operation, the empyreumatic oil being retained by the charcoal in the still.

Mr. Henry Wilson, of Stockton-on-Tees, County of Durham, England, has patented an improved apparatus for blowing, cooling, purifying, and otherwise attemperating air. This invention consists in certain novel features in the construction and arrangement of air pumps, suction and blowing engines, and devices combined therewith, for cooling, purifying, heating, and otherwise attemperating air or gas.

Mr. Patrick Shea, of South Boston, Mass., has patented an improved ironing board clamp, for securing an ironing board upon and above the top of an ordinary table, also in providing a support for the flat iron. The invention consists of a frame composed of two horizontal parallel bars, whose inner ends are respectively secured in the upper and lower edges of a block, which, with the bars, is designed to rest upon the table top to support the ironing board, said bars having their outer ends secured in the vertical slot of a head block that has a flange projecting inward at right angles from each end.

Mouth-pieces or holders for cigars and cigarettes have heretofore been made from glass by a moulding process, which leaves the articles thin at the mouth-place, where they are most liable to be broken. Mr. Adolph Demuth, of Brooklyn, N. Y., has patented a glass mouth-piece for cigars and cigarettes with an extra thickness of material at the mouth part, where most required.

© 1881 SCIENTIFIC AMERICIAN, INC

MECHANICAL INVENTIONS.

Mr. Henry A. McLaughlin, of Karns City, Pa., has patented an automatic grain and liquid weighing scale. In this weighing scale a revolving wheel, provided with buckets and held stationary by spring catches for the reception in a bucket of the material to be weighed, is automatically dumped. Combined with the revolving bucket wheel is a pivoted delivery spout arranged beneath a hopper which supplies material to the wheel. This spout has a counterbalance arm or weight which serves to adjust it into a non-delivering position as the bucket wheel attached to the rack of the scale commences to sink by the weight of material in a bucket. A spring also acts upon the spout in a like direction. The ascent of the dumped wheel and its attached rack adjusts said spout into a delivering position. The apparatus is also provided with a cam shaft which, on being turned, causes a scraper or scooper at its middle to carry small finishing quantities of the material to be weighed into the bucket, after which the rack and bucket continue their descent and the spring catches which hold the bucket wheel are released by hammers, and the bucket wheel is left free to rotate for the purpose of dumping its load.

An improved clothes washer has been patented by Mr. William Watlington, Jr., of Stony Point, Ind. The object of this invention is to save time and labor in washing clothes. This machine is simple in construction and effective in its operation.

An improvement in machines for winding silk has been patented by Mr. Henry H. Bartlett, of Watertown, Conn. The object of the invention is to soften raw silk and prevent generation of electricity in boiled silk during the process of winding. The invention consists in providing the winding machine with a steam generator for dampening or moistening the silk by a spray of steam, whereby the gum on the raw silk is kept soft, and in the case of boiled silk it is rendered flexible while being wound, and the generation of electricity is prevented. The steam generator for effecting these results is arranged below the swifts of the machine, and is provided with perforations in its upper side for the distribution of steam to the silk on the swifts.

A new fluid pressure regulating valve has been patented by Mr. William M. Sloane, of Brooklyn, N. Y. This invention relates to that class of valves for regulating the pressure of gas, steam, air, or other fluid, or, rather, for delivering such fluid under a uniform and reduced pressure from a reservoir thereof under high pressure, which usually consist of a valve opening against the high pressure and a diaphragm tending to keep this valve open, while the pressure admitted through the valve on one side of the diaphragm tends to keep the valve closed, which actions and reactions cause the gas to be delivered uniformly under the desired pressure, according to the adjustment of the diaphragm.

An improved machine for cutting ice has been patented by Mr. Chauncy A. Sager, of Valparaiso, Ind. The invention consists in the combination with a traction ice-cutting machine of a peculiar laterally swinging cross-cutting device for cross-cutting the ice at right angles to the line of motion of the machine, and while the machine is in motion making longitudinal cuts. The frame of the machine is mounted on wheels and carries a vertically swinging arm having a longitudinally cutting saw attached, operated by suitable mechanism, also carrying a laterally swinging frame depending from a vertically adjustable frame and supporting a longitudinally moving revolving shaft with a cross-cut saw thereon, springs serving to control the longitudinal movement of said shaft. Devices are also provided for holding the pulley which drives this shaft in position and the cross-cut saw and its shaft in place for cross-cutting the ice while the machine is being propelled forward.

Mr. William P. Brosius, of Richmond, Va., has patented a steam gauge for sewing machines. The object of the invention is to provide a device which shall enable the operator to run subsequent rows of stitching in parallel position to and at regulated distances from the first; and the invention consists in a peculiar construction and arrangement of a gauge composed of a spring arm with a stop or guide lug at its lower end, a horizontally adjustable slide carrying said arm, and a block adapted to be attached to the presser foot, which block is connected to the adjustable slide by a set screw and a rib or groove, which prevent the slide from turning axially about the set screw.

NEW SHOT-CASE AND DISTRIBUTER.

The improved shot-case shown in the engraving is of cast iron, japanned and ornamented, and provided with glass windows which expose the different kinds of shot to view. The case contains as many compartments as there are windows, and each compartment has an aperture at its bottom communicating with a hollow cylinder in the center through which works the vertically adjustable valve tube, as shown. The lid fitted to the top of the vessel may be turned independently of the shell. The lid controls and rotates the adjustable valve tube, therefore, if the index knob of the lid is pushed to the center of any division, the contents of that particular division may be drawn by pressing down the tube. A scale pan swings immediately under the discharge tube and receives the shot. When the desired quantity has been weighed the hand is removed from the knob and the flow of shot is instantly stopped. The vessel rests and rotates on a circular stand which supports the weighing attachment, consisting of a simple balance beam, a scoop, and nested weights.

A revolving disk indicates the grade of shot in any division. In the lid there is an opening through which the case is filled. This opening is provided with a cover that swings around automatically and closes the opening, excluding dust. A spiral spring holds the vertical tube and rests upon and presses the automatic cover, keeping it always closed.

This case, aside from being a great convenience in retailing shot and effecting a considerable saving in shot by avoiding spilling, prevents the shot from becoming mixed. It is well

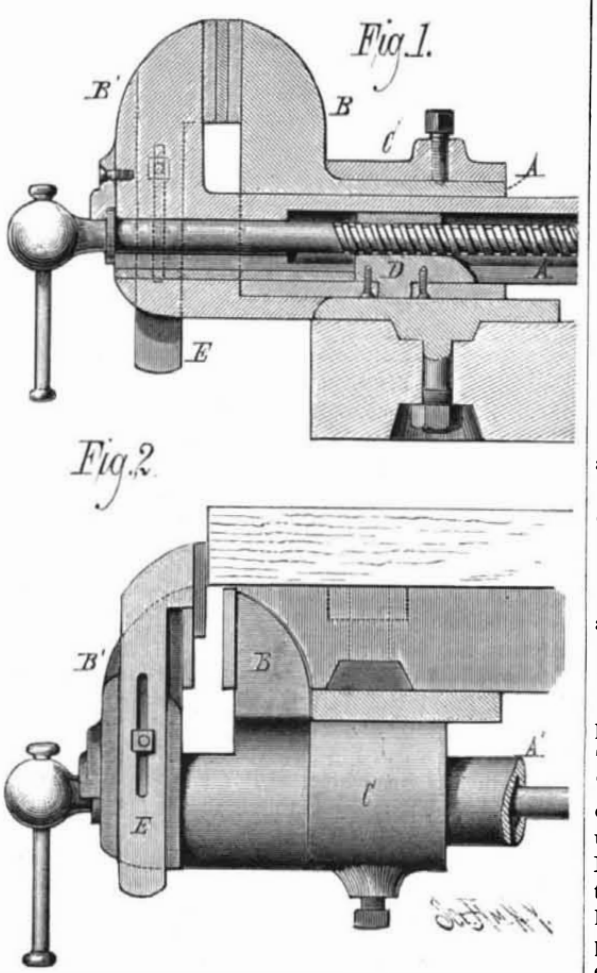
BOOTON'S SHOT-CASE AND DISTRIBUTER.

known to sportsmen that shot of different sizes discharged together will fly irregularly and render the shot inaccurate and ineffective.

For further information address S. Booton, of 105 Worth street, New York city.

IMPROVED VISE.

The vise shown in the accompanying engraving is especially designed for woodworkers, and is capable of being arranged above the bench, or at its side, or underneath. The vise has an outer cylinder, A, cast with the inner jaw, B,



HENDRY'S VISE.

and an inner concentric tube, A', is cast with the outer jaw, B'. These jaws may be provided with removable wooden faces to prevent marring planed work when held between them. The outer cylinder is received by a collar, C, cast with a securing base and bolt for the attachment of the vise to the work bench.

The vise is capable of being revolved in the collar, or the collar upon the outer cylinder, to permit of reversing its point of attachment to the under side of the bench, as seen in Fig. 2.

A screw is connected to the inner tube, A', so as to revolve independently and effect its movement back and forth. This screw is received by a tubular nut, D, in the tube, A'.

To the sides of the movable jaw, B', are applied adjustable plates, E, having slots and adjusting screws. These plates have affixed to their front edges a cross piece or face connecting the two plates together upon the inside of the jaw.

By reversing the attachment of the vise to the under side of the bench, as seen in Fig. 2, the face of the device, E, can be presented toward the end of the bench and be adjusted so as to stand above the bench, and hold one end of the board being planed or otherwise operated upon while being held by the usual bench stop at its other end.

This invention was recently patented by Mr. Alexander Hendry, of Fayetteville, Ark.

The Extraction of Sulphur from the Ore.

A new method of extracting sulphur from the rich native ores of Sicily has been invented by MM. de la Tour du Breuil, and the process is perhaps adaptable to other sources of sulphur, notably spent oxide from gas purifiers. The old Sicilian method of roasting the ore and melting the sulphur, in piles similar in construction to charcoal-burners' kilns, was very wasteful, and gave rise to the diffusion of intolerable fumes of sulphurous acid. The new process is very economical, and does not occasion any nuisance. The principle employed is that of raising the boiling point of water, by the presence of a salt, until it just exceeds 115° C.—the melting point of sulphur. Chloride of calcium is the salt employed in this case, on account of its fixity, cheapness, and complete inertia in presence of sulphur at the temperature attained in the process. The mode of operation is exceedingly simple. Two rectangular boilers, coupled together and inclined in position, are heated alternately from one furnace. The liquid, containing 66 per cent of chloride, is introduced into one vessel which is previously charged with sulphur ore. The process of liquefaction takes two hours; and, the other boiler being meanwhile emptied and recharged, the work goes on alternately without interruption. The method is said to be exceedingly economical, the cost of extraction being about five francs per ton. The sulphur is recovered in a state of great purity, and as it is only melted in a water bath instead of sublimed, there are no fumes evolved. The extraction is, moreover, very complete, not more than two or three per cent of sulphur being left in the matrix, even in the case of raw ore; while with such finely divided material as sulphur oxide the residuum irrecoverable by the process would probably be even less. The greatest recommendations of the process are apparently held to be its freedom from sulphurous acid exhalations and its great simplicity, not even a steam boiler being required; although the liquefying vessels might perhaps be heated with advantage by steam pipes, containing steam at a pressure of about twenty pounds above the atmosphere. These and other modifications might be found advisable if the process were tried on a large scale for the continuous treatment of sulphur material.

The Expenditure of Energy in Incandescent Electric Lighting.

At the York meeting of the British Association, Sir W. Thomson and Mr. Bottomley gave the results of some experiments carried out by them in order to determine the illuminating power of incandescent vacuum electric lamps with various strengths of current. Every lamp was tried with higher and higher potentials until the carbon broke. The electricity was obtained from a number of Faure's cells, of which 26 were first put in circuit, developing 0·093 horse power, and others were added until the lamp was destroyed. Three lamps only were tried, the first of which broke down after fourteen experiments; the second lasted through fifteen tests; and the third broke before the third reading could be completed.

With 26 cells the first lamp gave the illuminating power of 11·6 candles; 4 more cells then brought it up to 25 candles; with 32 cells it showed 42 candle power; and successive additions of cells forced the light up through a very irregular scale until, when giving the maximum of 114 candle power, the carbon gave way. The next lamp was first tried with 40 cells, affording 0·27 horse power, and giving the light of 49 candles; and the lamp broke when connected with 70 cells, when the light would have been over 200 candles. The irregularity of all the records is very striking, the power of the batteries and the light given by the lamps being very uncertain and by no means increasing in any common ratio. For example, the first lamp gave the light of 84 candles, with the expenditure of 0·247 horse power, from 40 cells. The next lamp, with the same number of cells, gave only 49 candle power in one instance and 35 candles in another, although the energy of 0·27 horse power was recorded, or nearly the same as before. Again, the second lamp gave 186 candle power with 56 cells, while the addition of 6 more cells, instead of increasing the light, brought it down to 180 candles. Much of this variation is said to be caused by the blackening of the interior surface of the globes by the deposition of volatilized carbon, when high powers were applied. The photometric method employed by the authors consisted of directly comparing the depth of shadows thrown by a pencil on a piece of white paper, and the candle employed was the usual standard sperm article, assumed to burn at the normal rate, but not weighed, as the object of the experiments was simply comparative.—*Journal of Gas Lighting.*

© 1881 SCIENTIFIC AMERICIAN, INC

Calcium.

(Symbol, Ca. Combining weight, 40.)

This element, although not existing in nature in the metallic state, is very plentifully distributed in combination with other elements. Chalk, limestone, and many other rock formations contain a large proportion of calcium, and as several of its compounds are applied to many practical and industrial purposes, the study of this element becomes of some importance. The metal itself is prepared with some difficulty by decomposing the chloride by means of a strong galvanic current; when thus separated, calcium occurs as a light yellow metal, which readily oxidizes in the air, forming CaO, the only oxide of the metal known. Calcium also decomposes water with formation of the hydrated oxide and liberation of hydrogen.

Calcium Oxide, or Lime, CaO.—This important substance is obtained by heating chalk or limestone to redness, when the carbonic acid is expelled, and CaO, or *quicklime*, as it is technically called, is left behind. It may be obtained in a state of almost absolute purity by heating Iceland spar or white marble in a crucible to redness; prepared in this way lime is a hard but brittle substance, white in color and absolutely infusible. The lime of commerce, being prepared from an impure carbonate, contains traces of iron, which give a slight yellow color, and also a small quantity of silica, which sometimes causes the mass to partially fuse. When quicklime is sprinkled with water, it slakes with great violence; a chemical combination takes place, with the usual accompaniment of considerable heat, and the hard lime eventually crumbles down to a soft, white bulky powder; this slaked lime is the hydrated oxide, and has the following composition, CaO,H_2O. The heat produced during the slaking of quicklime is very considerable, and is a matter of common observation; in some cases it has been found sufficient to char and even kindle dry wood, and fires have been caused in this way. By exposing the hydrate to a strong red heat the water can be driven off, and quicklime again obtained. The hydrated lime is slightly soluble in water, but, strange to say, more so in cold than in warm water; one gallon of cold water (60° Fah.) will dissolve about 90 grains of CaO, while the same quantity of boiling water will dissolve only 60 grains. This lime water possesses a distinct alkaline reaction, in this respect resembling, although to a less degree, the hydrated oxides of potassium and sodium; it is used by the chemist as a test for the presence of carbonic acid, as the surface of the liquid will become instantly covered with a white pellicle of calcium carbonate if exposed to an atmosphere containing any carbonic acid. Quicklime is largely used for building purposes and for increasing the fertility of the soil. Ordinary mortar is made by mixing quicklime, water, and sand together; the mixture, which is at first pasty, gradually hardens, partly by evaporation of moisture and partly by the absorption of carbonic acid from the atmosphere. Hydraulic mortars or cements are made by heating together limestone and a peculiar kind of clay; the burnt mixture contains lime and silica, which to some extent combine on addition of water, causing the mass to set as hard as stone. Lime is also largely used in agriculture as a fertilizer; it is specially valuable on stiff clay lands, where it serves to decompose the silicates of the clay, and thus liberates certain potash salts which are essential to the growth of plants. Lime wash, or milk of lime, as it is sometimes called, is very useful in the brewery for painting the interior of vats and utensils when not in use; the lime acts beneficially by destroying the vitality of any organisms which may have collected on the surface of such vessels, and also by counteracting the acidity which always develops in the pores of unused brewing vessels.

Salts of Calcium.—Several of these are of considerable importance, and are used in many industrial processes; the compounds of calcium have a special interest to brewers, for some are found in most well waters, and are believed to exert a marked influence on the brewing operations.

The carbonate, $CaCO_3$, is the basis of most of the other salts of calcium, and is found in large masses in nature, forming whole mountains of limestone and marble, and also occurring in large masses, as chalk, coral, etc. Carbonate of lime, as it is still more commonly called, is practically insoluble in pure water, and yet it is found as a constituent in almost all river and well waters. This is due to the fact that these waters always contain some carbonic acid dissolved in them, and this acid keeps the carbonate in solution. In this way as much as twenty to twenty-five grains of carbonate of lime per gallon are held in solution. The presence of carbonate of lime gives the character of hardness possessed by some waters; but it is only a temporary hardness as distinguished from the permanent hardness produced by other and more soluble lime salts. It is called temporary, because this hardness can be destroyed by boiling the water; the excess of carbonic acid being expelled by heat, the carbonate deposits in the form of a crystalline powder, and often as a hard incrustation, which is a source of great trouble and danger to steam users. In brewing operations this carbonate of lime is rather beneficial than otherwise, for it serves to check any undue acidity in the malt, and for this reason it is not advisable to cause the whole of the carbonate of lime to deposit by violently boiling the brewing water before mashing. An ingenious method of destroying the temporary hardness of the water was suggested by Dr. Clark, whose process consisted in adding a sufficient quantity of lime dissolved in water to combine with the excess of carbonic acid, which then separates in the form of carbonate, carrying down with it nearly all the carbonate of lime originally present in the water and now no longer soluble, after removal of the carbonic acid. Many suggestions have been made for preventing this incrustation of steam boilers by deposit of carbonate of lime; among the most rational is the addition of some sal ammoniac (chloride of ammonium), which, by double decomposition, leads to the formation of chloride of calcium, a very soluble salt and carbonate of ammonium, which is volatilized by heat; but the objection to this method is the corrosive action which the vapors of carbonate of ammonium exert on engine fittings when the steam is used for obtaining motive power. A better way of preventing incrustation is to add some flocculent matter to the water, which serves as a surface on which the carbonate can deposit, thus preventing the crust being formed on the boiler plates. Chemists use a standard solution of soap for determining the hardness of water, and this solution is made of such a strength that each degree represents one grain of carbonate of lime per gallon. A known quantity of the water being taken, the soap solution is carefully added, until, on shaking the mixture, a permanent lather is formed, which takes place so soon as the lime salts are all precipitated.

The sulphate, $CaSO_4$, better known as gypsum, is also found in considerable quantities in some localities, often associated with rock salt; in its natural state the salt is generally combined with two molecules of water, which, however, can easily be expelled by heat, and then the powdered residue is known in commerce as plaster-of-Paris, and is largely used for making casts or moulds, as, on being mixed into paste with water, it becomes hydrated again, and sets into a hard mass. Calcium sulphate, or sulphate of lime, as it is still more commonly called, is slightly soluble in water, one part requiring about 500 parts of water for its solution; like lime, it is less soluble in boiling water than at lower temperatures. Several salts, especially common salt (chloride of sodium), greatly increases the solubility of sulphate of lime in water. Most well waters contain sulphate of lime as a constituent, and brewers have long known that this salt exerts an appreciable influence on the brewing processes; one of the peculiarities of the celebrated Burton waters is the presence of a considerable quantity of sulphate of lime, and it is believed this salt removes from beer worts, or perhaps prevents the solution of certain nitrogenous constituents which are very prone to decomposition, and which, if left in the beer, would lead to its destruction as a drinkable fluid; in whatever way sulphate of lime may act, there is no doubt that its presence in a brewing water materially affects the character and flavor of the beer brewed with it. There is one objection to the presence of sulphate of lime in a brewing water, and that is that it is liable to undergo a reduction to the state of sulphide by removal of oxygen, which change is brought about, there is reason to believe, by minute organisms called bacteria; this sulphide is, in its turn, decomposed as rapidly as it is formed by the acids, which are always present in beer, and sulphureted hydrogen, a foul-smelling gas, is thus evolved. The peculiar and objectionable smell which beers brewed with water containing much sulphate of lime acquire in warm weather, may be accounted for in this way. Sulphate of lime also contributes to the hardness of natural waters, and, not being removed by boiling, it is described as *permanent;* the soap test previously alluded to is also valuable for determining this hardness; by applying it to the well-boiled water —that is, after all the carbonates have been removed by boiling –the amount of sulphate of lime may be easily determined.—*Brewers' Guardian.*

A Convenient Pipette.

Sometimes the chemist hesitates to apply his lips to the end of a pipette when the lower end of it dips into strong ammonia, chlorine water, or, still worse, prussic acid, chloroform, and the poisons. How often the lips are burned with acid or blistered with alkali! C. Mann describes a modification which any chemist can apply for himself. A wide glass tube, that can subsequently be graduated, is drawn out at one end like a pipette and widened or bent outward at the other end. This tube or pipette is passed through a hole in a cork that fits a wider glass tube ten centimeters (four inches) long or more. The upper end of the wider tube is closed airtight with a cork. To make both corks set as tightly as possible in the wider tube they are rubbed with powdered rosin. The upper half of the thinner pipette tube is greased to make it slip through the cork more easily. The narrower tube is shoved up into the wider one until the end is very near the cork. The lower end is then dipped into the liquid and the wide tube pushed up with the finger, leaving a vacuum in the tube into which the liquid rises. With a gentle pressure the liquid rises so quietly that even small drops can easily be taken off the surface of a liquid in a narrow cylinder. Besides using it for corrosive liquid and for taking off the upper or lower of two that do not mix, it can also be employed for taking up slight precipitates on the bottom of a vessel, or for passing one liquid to the bottom of another without disturbing the latter.

Another device for filling pipettes with fuming liquids consists in keeping the liquid in wide mouthed bottles provided with double bored corks, through one of which orifices there passes a short bit of glass tubing bent at right angles. On passing the tube of any pipette through the second orifice and blowing through the shorter tube the liquid will rise to any desired height in the pipette. Most pipettes have delivery tubes of one size, and hence different pipettes can be inserted successively in the same cork if desired.

Frequently a wash bottle is inserted between the mouth and the pipette, and then the liquid is sucked up into it. Where solutions of chlorine or sulphurous acid are to be pipetted, suction of any sort reduces the pressure and may cause a loss of gas, and leave a weaker solution behind.

P. N.

MISCELLANEOUS INVENTIONS.

Messrs. Nathaniel F. Harris and Martin Thoeni, of Monticello, Iowa, have patented an improved metal can for packing butter, etc., so constructed that air shall be completely excluded from the contents when the cover is soldered on, and so that the molten solder shall not heat the contents, and the cover can be easily unsoldered without injury to the can. The body of the can is formed with an outwardly flaring rim, and the cover also with a flaring rim. These rims are so arranged as to leave a space between them and form a groove for reception of a stripping wire which is soldered to the two rims, and serves to unite the cover with the body of the can.

Mr. James B. Pollock, of Port Richmond, N. Y., has patented a ventilating apparatus for white lead stacks. This invention consists in a combination in a white lead corroding stack or bed with the tiers of pots containing the lead and boards covering the same, of a board lining of the central ventilating flue made in sections, extending from the covering boards of one tier of pots to the bottom of the next tier, and in providing the flue with valves controlling the several tiers, whereby the ventilation may be regulated as required and the tan bark of the stack is prevented from falling into the flue.

Mr. Charles W. Minear, of Kirksville, Mo., has patented a baling press. The object of this invention is to facilitate the compression of hay, cotton, straw, moss, and other substances into bales. In this press the baling box is mounted upon wheels for convenience in moving it from place to place. The power is applied to a horizontal sweep fast upon an upright shaft, and the connection with the follower made by a chain through the intervention of a cam having a sleeve fitting said shaft, a cam plate fast on the latter provided with a spring catch bar, which engages and disengages with the cam, and a lever pivoted to the follower and having a rocking fulcrum connection with the baling box. By revolving the upright shaft the follower is forced forward, and means are provided for automatically releasing, at each revolution of said shaft, the operating cam, which controls the follower chain, also for permitting of the follower being drawn back.

An improvement in tooth brushes has been patented by Mr. Louis Chevallier, of Brooklyn, N. Y. The object of this invention is to provide a brush with a reservoir for water to be used during the application of the brush. The invention consists in the peculiar construction of a brush, having attached to its handle an elastic bulb or bag, that communicates with the bristle plate or face of the brush by means of a tubular passage formed through said plate and handle, the end of the tubular handle being extended to nearly the bottom of the bulb, whereby all the water in the bulb may be easily ejected when the brush is held with the bulb downward.

Mr. John Harvey Ludwick, of Dallas, Texas, has patented an improvement in reflectors for lamps and handles thereof. The invention consists in providing the lamp body with a flanged and recessed strip and the reflector with a projecting flange sliding into the recess of the strip, whereby the reflector is securely held in place and is readily detachable when desired. It also consists in a loop and catch connection of the handle of a reflector lamp with the reflector and body of the lamp, to admit of the detachment of the handle. This construction facilitates cleaning, repair, or renewal of the reflector, etc., also transportation.

Mr. Benjamin Goodyear, of Carlisle, Pa., has patented an improved device for handling and carrying jars, bottles, etc., safely and conveniently. The invention consists in a frame formed of a series of wires attached to a handle and to a ring, from which they project downward, and have their lower ends bent toward each other, so as to catch under the bottom of the bottle or jar.

Henry H. Heise and John H. Kauffman, of Columbia, Pa., have patented a steam generator for cooking feed, sweating tobacco, and other purposes. The invention has for its object the combining of simplicity with efficiency and perfect safety. It consists of a cylindrical fire box having a deflecting arch mounted upon a suitable grate and base and provided with a concentric fuel magazine, in combination with a lengthening cylinder for enlarging the fire chamber, and an outer inclosing steam generating chamber provided with the usual boiler appliances.

Mr. Alfred S. Clark, of New Orleans, La., has patented an improved machine for brushing and polishing boots and shoes on the foot of the wearer The invention consists in a reciprocating rod provided with brushes at the sides and bottom and guided in the legs of a frame, to which a swinging lever is pivoted, actuated by a crank and intermediate cogwheels, and connected with the brush rod, which it reciprocates.

Mr. Christian H. Scheermesser, of McKeesport, Pa., has patented an improved tube drawing mandrel for forming lap welded tubes. It will not stick in the tubes and will permit of quicker and easier drawing and better welding.

© 1881 SCIENTIFIC AMERICIAN, INC

WASPS AND THEIR NESTS.

The common wasp is found all over the globe, and is known by its long slender body, colored yellow and black, and by its four wings, two of which are folded double over the back when in repose.

The true wasp is always social, living together in large numbers. Wasps may be divided into three classes, male, female, and neuter; only the two latter are provided with stings. One radical difference between the bees and the wasps is that the wasps do not secrete wax. They build their nests of a gray or reddish paper, formed of fibrous substances that they tear off with their powerful mandibles, and fasten together with their gluey saliva. The arrangement of the cells is also slightly different. Another peculiarity is the desertion of the wasps' nest at the first frost.

The perfect females pass the winter hidden in the moss, on the ground, or in the holes in walls or trees. In the spring they awaken from their long sleep and start out to seek food. They attack the blossoms of the young fruit trees, and, later, the currant bushes. This is the best time to destroy as many wasps as possible, for each female wasp that is killed prevents the formation of a nest.

The food of wasps and the mixture they feed to their larvæ is much more varied than the nourishment of the bees. Wasps are fond of all kinds of sweet things, especially honey, which they often try to steal from beehives. Their tongues are too short to obtain honey directly from flowers, but they attack the ripe fruit where the skin has been broken by rain or birds; they drink the sweet sap exuded by trees, and from these substances they make a tolerably sweet honey, which they store away or feed to their young. Wasps will also seize living insects, even spiders, and tear them apart to feed to the larvæ. In the autumn they will even come inside the window to seize the housefly, and in the woods, one can often notice the sudden disappearance of all flies at the approach of a hornet. They will voraciously devour the meat exposed on the stalls in the market, and often cause serious loss to the careless butcher.

Wasps are much more nocturnal in their habits than bees; and it must be remembered that in the evening, when it is perfectly safe to handle a beehive, it may be dangerous to attack a wasps' nest, as the wasps may still be flying in and out.

In France, the wasps generally make they broken holes, either in the earth or in trees and walls and under the roofs of houses. Nests have even been found in old barrels and deserted beehives, the remnants of whose honey had probably served to nourish the intruders.

The underground nests are very brittle and easily broken, as they are made of bits of decayed wood and bark glued together. They are the color of fallen leaves. The common wasp and the "*German wasp*" are very similar, and generally build their nests in the abandoned holes of the field mice and moles. They dig out the earth to enlarge the nest, and spread it in little piles about to hide the entrance to the hole.

In the ordinary nest the comb is protected by a concentric covering and divided into three distinct parts: 1st. One or perhaps more combs or layers of hexagonal cells. 2d. Pillars that join and support the different combs. 3d. An outside covering composed of several membranes of paper, which is covered with a sort of gluey varnish that is secreted by the wasps' tongues, and gives the nest a silvery varnish. On account of this varnish and the convex form of the nest, neither the rain nor cold can penetrate into it, consequently the temperature of the nest is higher than that of the atmosphere, sometimes being fourteen or fifteen degrees warmer.

The mother wasp commences her nest in the beginning of summer, and first constructs a foundation of woody fibers, which she builds up in the form of a capsule, forming in the center eight or ten cells, to which she adds new cells when necessary.

The first eggs are always working wasps or neuters, and the mother wasp is forced to leave the nest frequently to obtain nourishment for them. Afterward, when these are grown, they do all the work, enlarging the nest, providing food for the later larvæ; and from this time the working wasps, which can easily be distinguished by their more slender bodies, are the only ones that are found flying.

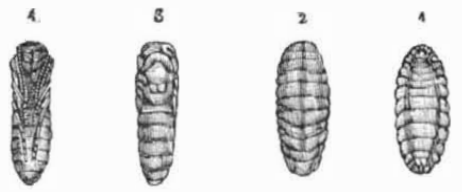


Fig. 1.—Eggs of the Common Wasp: Larva—1, beneath; 2, above. Nympha—3, above; 4, beneath.

From the first of August to November the mother only lays the eggs of males and perfect females.

The larvæ (Fig. 1), which are white and without legs, are attached to the cell by the extremity of their abdomen, and hang head downward. There are two brilliant spots on their heads, and their mouths are stronger than those of the bee larvæ, as they receive tougher food. When the larvæ are fully grown they turn over and weave a slight tissue of silk around themselves and the cell, then, resuming their old position, they close the opening of the cell with a thicker silk, and remain quiet for several days. At the end of that time the larvæ have become nymphæ, which are the complete wasp, covered with a thin skin, through which can be seen the three divisions of the body, with their developed organs folded under the abdomen. These nymphæ are at first white, and then gradually become colored, commencing always with their black eyes; and for several days after they have broken their coverings the wasps are less yellow than they become afterwards. When fully grown the wasp tears the silk tissue and breaks open its cell with its mandibles and flies out of the nest.

A third species, less known, is the red wasp, which frequents only the woods and builds its nest underground. The nests are small and not populous. These underground nest-builders may be distinguished from the common wasp by their abdomens, which are not all yellow and black, but are either red or striped with red. These wasps have numerous enemies, among whom the volucellis are the most formidable, as they are colored somewhat like the wasp, and consequently can easily penetrate into the nests and eat the larvæ, thus rendering us a great service in those warm dry seasons when the wasps' nests are overflowing with their intolerable brood.

The hornets' nest is much larger than all other varieties, and is usually built in hollow trees or under large roots on the ground, or in old walls, chimneys, etc. These nests, which are composed of a sort of pulp of decomposed wood, are very friable. They have a single envelope, and are always placed in some hole for an additional covering and protection. Hornets are very irritable and will attack in crowds any one who they think will hurt their nest. They seek to attack the places where the body is unprotected by clothes, and as their repeated stings are very dangerous, it is best always to rush to the nearest water and completely submerge one's self.

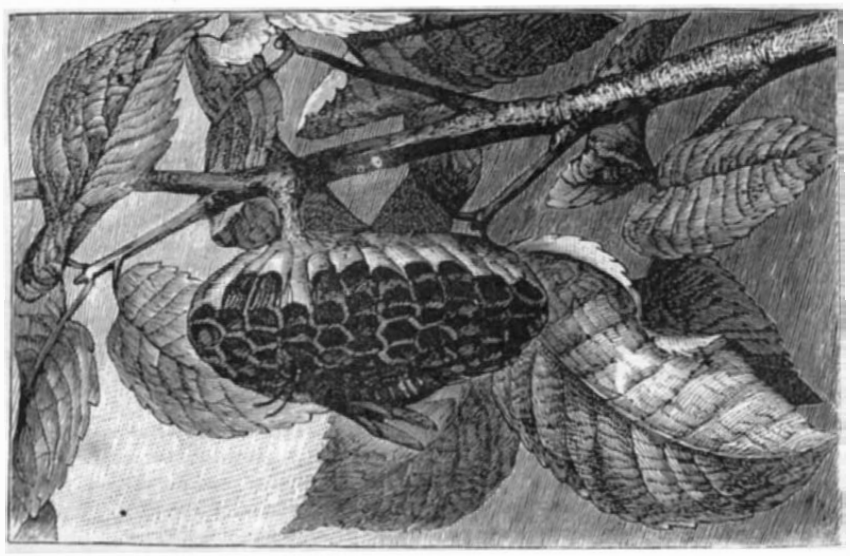


Fig. 3. WOOD WASP AND NEST, SHOWING ARRANGEMENT OF THE LOWER COMBS.

Strange to say, in spite of the hornet's peculiarities and carnivorous instincts, it has one friend in the insect world. It is a large black coleoptera, the *Velleius dilatatus*, distinguished by the peculiarity that, when disturbed, it drops its body and trains it on the ground like a little lizard. This insect follows the wasp in the evening into the nest, of which it makes itself the protector. It furiously attacks all insects that are hurtful to the young wasps, especially the centipedes, which they continue to shake long after the insect has been torn to death by their powerful mandibles. It is also possible that the strong odor of muck about the *Velleius* may be pleasant to the hornets and agreeably perfumes their nests. In return, the hornets permit it to eat some of the honey, of which it is very fond.

Though this insect is very timid at first, it soon becomes accustomed to any one who will properly nourish it, and can be easily domesticated in order to observe its habits. It can be taught to take honey from the end of a fine brush, and it will cling so tightly to its food that it is difficult to make it let go.

There are a few wasps that build their nests entirely uncovered, simply attached to the branch of a tree. These nests are made of woody fibers, torn from decayed wood or plants, and are very flexible and elastic.

The concentric envelopes on the outside of the nest have such a great resemblance to gray filtering paper, that it would seem as if the wasps had preceded man in the invention of paper. This species is the wood wasp, Fig. 3. It is a little smaller than the common wasp; the female has a more velvety body, and the neuter is quite smooth. This species is spread all over Europe, except perhaps in Lapland.

There is another group of wasps that are distinguished by the inferiority of their nests, which are never provided with an envelope to protect them from the weather. These nests are simply a comb supported on a strong stand; the cells are oblique or recessed, and more or less numerous according to the size of the brood.

These wasps are more slender than the ordinary wasp, fewer in number, less irritable, and much less destructive to fruits and plants. In the month of April this wasp (Fig. 2) can be seen commencing his little nest in some warm spot exposed to the sun

Fig. 2.—WASPS' NEST WITH THE MOTHER WASP.

© 1881 SCIENTIFIC AMERICIAN, INC

but well sheltered from the rain. These wasps are so gentle that even if the nest is carried away the mother wasp will not offer to sting, but clings to the nest or flies close to it. If the branch with the nest on it is carried into a house she will still follow and continue to feed her eggs. When these are hatched they readily become accustomed to the presence of man, and it is possible to observe, at home, the habits and development of these curious insects.

Military Ants of the Amazon.

The *Nineteenth Century* has the following: The most astonishing insects, if not the most astonishing animals, in the world, are the so-called "foraging," or, as they might more appropriately be called, the military ants of the Amazon. They belong to several species of the same genus, and have been carefully watched by Bates, Belt, and other naturalists. The following facts must therefore be regarded as fully established.

Eciton legionis moves in enormous armies, and everything that these insects do is done with the most perfect instinct of military organization. The army marches in the form of a rather broad and regular column, hundreds of yards in length. The object of the march is to capture and plunder other insects, etc., for food, and as the well organized host advances, its devastating legions set all other terrestrial life at defiance. From the main column there are sent out smaller lateral columns, the composing individuals of which play the part of scouts—branching off in various directions, and searching about with the utmost activity for insects, grubs, etc., over every log and under every fallen leaf. If prey is found in sufficiently small quantities for them to manage alone, it is immediately seized and carried to the main column; but if the amount is too large for the scouts themselves to deal with, messengers are sent back to the main column, whence there is immediately dispatched a detachment large enough to cope with the requirements. Insects or other prey which, when killed, are too large for single ants to carry, are torn in pieces, and the pieces conveyed back to the main army by different individuals. Many insects in trying to escape run up bushes and shrubs, where they are pursued from twig to twig by their remorseless enemies, till on arriving at some terminal ramification they must either submit to immediate capture by their pursuers, or drop down amid the murderous hosts below.

As already stated, all the spoils which are taken by the scouts, or by the detachments sent out in answer to their demands for distance, are immediately taken back to the main army or column by two smaller columns of carriers, which are constantly running in two double rows (one of each being laden and the other not) on either side of the main column. On either side of the main column there are constantly running up and down a few individuals of smaller size, lighter color, and having larger heads than the other ants. These appear to perform the duty of officers, for they never leave their stations, and while actively running up and down the outsides of the column, they seem intent only on maintaining order in the march, stopping every now and then to touch some member of the rank and file with their antennæ, as if giving directions.

When the scouts discover a wasps' nest in a tree, a strong force is sent out from the main army, the nest is pulled to pieces, and all the larvæ in the nest are carried by the carrier columns to the rear of the army, while the wasps fly around defenseless against the invading multitudes. Or, if the nest of any other species of ant is found, a similarly strong force is sent out, or even the whole army may be deflected toward it, when with the utmost energy the innumerable insects set to work to sink shafts and dig mines till the whole nest is rifled of its contents. In these mining operations the Ecitons work with an extraordinary display of organized co-operation; for those low down in the shafts do not lose time by carrying up the earth which they excavate, but pass on the pellets to those above, and the ants on the surface, when they receive the pellets, carry them only just far enough to insure that they shall not roll back again into the shaft, and, after having deposited them at a safe distance, immediately hurry back for more.

The Ecitons have no fixed nest themselves, but live, as it were, on a perpetual campaign. At night, however, they call a halt, and pitch a camp. For this purpose they usually select a piece of broken ground, in the interstices of which they temporarily store their plunder.

Transparencies Produced by Luminous Paint.

BY ROBERT VINCENT.

In May last I forwarded a brief account of a plan that I had employed for some time past for producing transparencies. The method is at once so simple and satisfactory that I do not hesitate again to call attention to it, and to recommend it particularly for making transparencies of large dimensions.

To give some idea of the sensitiveness of the gelatine plates that I employ, I may mention that an ordinary fish-tail burner at six feet distance will produce an excellent transparency in ten seconds, or, if the negative be dense, then fifteen seconds are required. In these circumstances, it may be asked, why resort to any other means of illumination?—there is nothing more handy than a gas jet, or less costly; while if the flame varies a little with the pressure, the difference in practice is scarcely observable.

I will try to explain the advantage of luminous paint over a gas-burner in the production of transparencies. In the first place, there are few dark rooms in which a suitable jet is to be found, or, if a suitable jet exists, it is not always in a convenient position for making exposures. Again, besides the vitiated atmosphere that results when a number of exposures are made in a close room, with the gas burning some time, there is the inconvenience of turning the light on and off continually during the operation; with a luminous paint screen, on the other hand, no clear intervening space of several feet is required, and its employment does not necessitate increased ventilation.

But the advantage of luminous point for transparencies is best seen when large negatives have to be copied. I have an "Aladdin's lamp," which I purchased of Ihlee and Horne, of Aldermanbury, and for which I paid eight or ten shillings—I forget exactly. This is nothing more than a big surface of luminous paint, framed, and glazed. With it I can produce transparencies up to 15 by 12. To do this with a gas-jet is of course quite possible, if you are at a considerable distance, but it is ten chances to one the whole surface of the negative is not uniformly impressed with the rays, which, under any circumstances, are not parallel. In the case of the luminous paint-screen, however, it is merely necessary to clap the printing-frame (containing the negative and the gelatine plate) face downward upon the "Aladdin's lamp," which has been previously exposed to daylight, and in a few seconds the exposure is complete.

It is a mistake to suppose that the exposure must needs take place the instant the "Aladdin's lamp" is removed from the daylight. If you use the "lamp" fresh, the chances are you will over-expose. Employed within one minute of its withdrawal from light—I am speaking of ordinary diffused daylight—an exposure of one second will often be too much; taking such plates of the sensitiveness I have mentioned, and the normal oxalate development (Dr. Eder's formula), which, for transparencies, at any rate, I much prefer to pyrogallic development. On the other hand, if, instead of using the "Aladdin's lamp" immediately, you wait five, ten, fifteen minutes, after withdrawal from daylight, you will find the light much more under control. I have made a dozen transparencies without re-exposure of the "lamp" to daylight. I find that, with my lamp, an exposure of three or four seconds is required after five minutes' withdrawal, an exposure of fifteen seconds after ten minutes, and an exposure of twenty five seconds after fifteen minutes—this with a negative of normal density. The delicate detail in the shadows so soon gets lost that over-exposure should always be avoided if you want a bright and vigorous transparency.

If your dark-room is not well lit, as soon as you have poured over your developer, you may turn the "Aladdin's lamp" round and use its light to develop by; I have never found any ill effects from its light, if only the development has begun before the "lamp" is made use of.

It is only since I have taken to the production of large transparencies that I purchased an "Aladdin's lamp." For many months I used nothing but a piece of cardboard, coated myself simply with the luminous paint, and protected from dirt by a piece of glass. This answers admirably for whole plates or any smaller pictures, and those who can obtain a small amount of the paint can perfect for themselves an "Aladdin's lamp" up to any size. The paint, when I inquired the price, was 28s. a pound, but a tiny sample I obtained was quite sufficient for the making of my first screen. I do not think there can be half an ounce of paint on the 15 by 12 "Aladdin's lamp" that I have, and therefore, if photographers could only purchase it in small quantities, the cost of a screen would be but nominal. Some of our apparatus dealers would find it worth their while to sell the paint retail, I should think, for any photographer who tries this plan of printing cannot fail to be satisfied with it.

To sum up the advantages of the "Aladdin's lamp" for making transparencies I would say:

The exposure can be more accurately timed than with a gas jet.

The rays being parallel, the transparency is more likely to be uniform in depth and tone.

There is no necessity for a space of several feet to intervene between the source of light and the frame; and finally, the "Aladdin's lamp" is not only more convenient and handy to use, but it does not, like a gas-flame, add further to the vitiation of the dark room.—*Photo. News.*

United States Fisheries of the Great Lakes.

The following statistics of the work of United States fishermen are taken from the report of G. Brown Goode, special agent of the fishery division of the United States Census Bureau, for the year 1879:

In the eight States bordering on the great northern lakes, including Pennsylvania, which has a comparatively limited lake frontage, there were 5,050 fishermen and 1,656 vessels, boats, and steam tugs engaged in taking fish. The value of these vessels, etc., was $266,000, and the total value of all apparatus and accessories was $1,345,975.

Of the eight States Michigan stands at the head as regards number of men, and Ohio in the value of investments, the latter being $233,600; the total fishing properties of the eight being valued at $497,400 in 1879.

Michigan, notwithstanding the less value of her investments, stands far ahead in the value of fish taken. Of the total, which was $1,652,900, her share was $711,695; the next being Ohio, at $355,000.

Whitefish, the kind taken in the largest quantity from the Michigan lakes, amounted to nearly 13,000,000 pounds, valued at $461,800, while the value of Ohio whitefish was only $39,500, or about one-twelfth as much.

The other States stand in the following order in total value of their fish products: Ohio second, $355,000; Wisconsin third, $276,605; New York fourth, $175,100; Illinois fifth, $53,000; Pennsylvania sixth, $42,480; Indiana seventh, $33,820; Minnesota eighth, $5,200. The whole of the fish taken by fishermen of the last named State are sold in fresh condition, while 11,000,000 pounds of the Michigan and Ohio fish, valued at about $300,000, are salted for market.

Of the salted fish nearly 600,000 pounds are pike taken by New York fishermen, which were sold for $12,000, barely two cents per pound.

Michigan, Ohio, Pennsylvania, and New York together sent 2,821,600 pounds of frozen fish to market, which brought $126,100.

The smoked fish came mostly from Ohio and Illinois, being largely whitefish and sturgeon. The total of smoked fish from the eight States was 1,721,770 pounds, valued at $109,970.

The report has also a grouping of the investments and products by lakes as well as by States, which shows that about 80 per centum of the investments in fish catching are on Lakes Michigan and Erie, 10 per cent on Huron and St. Clair, 6 per cent on Superior, and 4 per cent on Lake Ontario.

Under this grouping the values present different proportions as follows:

Lake.	Value.	Proportion.
Michigan	$668,400	about 40 per cent.
Erie	412,880	" 25 " "
Huron and St. Clair	293,550	" 18 " "
Ontario	159,700	" 10 " "
Superior	118,370	" 7 " "
Total	$1,652,900	100

There are other tables showing the quantities and values of caviare, isinglass, and oil made from the fish taken on the lakes. They show that all the caviare and most of the oil come from the sturgeon, and that from three-fourths to four-fifths of these three products come from Ohio.

Oil Painting on Woven Fabrics.

Canvas, indeed, is often employed by artists for oil paintings, but then the canvas is stretched tightly on a frame. To paint on loose cloth without entirely destroying its flexibility has hitherto been impossible. Besides this many colors lost their brilliancy, and hence are less effective upon woven fabrics.

Gutmann of Florence, after many years of experimenting, believes that he has overcome all difficulties, and that with his process the goods will retain their freshness and pliability. The colors shall be as effective as those on the finest printed goods, and even surpass them. If the painting is done on silk or satin the colors have the appearance of enamel, and the shade varies with the gloss of the silk. As neither varnish nor gum is employed the colors preserve their freshness, which is heightened by exposure to the air and light. The colors cannot blacken in time, as is the case with oil colors; and, above all, the goods retain their softness.

A composition made of distilled water, molasses, benzole, turpentine, alcohol, and nitro-benzole, is poured into a vessel containing twice as much boiling water. During the whole operation it is kept at as high a temperature as possible, so that the greatest amount of vapor will be given off. If the mixture gets cold it cannot be used again. As soon as vapors are given off from it the wrong side of the goods is held over it for a few minutes, so that the vapor shall pass through the fabric. After drying for several hours it is ready for use, and may be stretched on a frame or over a piece of wood or cardboard.

In regard to the painting itself, the design is first sketched with an ivory stylus, and using impression paper—red for black or dark stuff and white for light colored. The little oil cans which always belong to the palette, and are generally filled with linseed oil, are now filled with a mixture of benzine, turpentine, alcohol, and nitro-benzole. When the pigment has been put on the palette, one or more drops of this mixture is dropped upon it, in order to dilute the color which is to be used. The pencils and brushes must also be soaked in the same peculiar composition every time before using them. The first coating is put on thick as a ground, so as to cover the stuff well. Everything that is to be pink, blue, or violet must have a white ground, which is allowed to dry one or two days. Little precautions about touching colors not yet dry are to be learned by experience.

P. N.

The Light of the Stars.

For a number of years the special work carried on at the Harvard Observatory, under the direction of Professor Pickering, has been the measurement of the intensity of the light of the heavenly bodies. Some of the results presented at a recent meeting of the Society of Arts, at the Institute of Technology, Boston, indicate measurements almost incredibly fine. The light which falls upon the earth from the satellites of Mars, for example, is about equivalent to what a man's hand on which the sun shone at Washington would reflect to Boston. The labor of measuring the brightness of all the visible stars was begun two years ago. It has since gone on at the rate of about 40,000 a year, and will be completed next fall.

© 1881 SCIENTIFIC AMERICIAN, INC

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Shafting Straightened in Position by Scofield's Patent Straightener. J. H. Wells, Manufacturer, Vineland, N.J.

New Comb'd Milling and Gear Cutting Machines, large range. C. A. Condé & Co., Makers, Philadelphia, Pa.

Printing presses with Patented Card Drop. See p. 250.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock, 80 to 88 Market St., Chicago, Ill.

List 27.—Description of 3,000 new and second-hand Machines, now ready for distribution. Send stamp for same. S.C.Forsaith & Co., Manchester, N.H., and N.Y.city.

Abbe Bolt Forging Machines and Palmer Power Hammers a specialty. S. C. Forsaith & Co., Manchester, N. H.

New Book.—A Treatise on Iron Founding. By Claude Wylie. Written for practical men. Illustrated. $1.40. Send for our catalogue of scientific books. E. & F. N. Spon, 446 Broome St., N. Y.

Garfield and Family.—Elegant engraving, 19 x 24, sent for 24 cents (stamps). Sheehy & Co., 33 Barclay St., N.Y.

Don't fail to see the New Automatic Engine built by the Lambertville Iron Works, now in operation at the American Institute, New York.

Mechanics'Watch, $10. Circul's free. Birch, 38 Dey St., N.Y.

Foot Lathes, Fret Saws, 6c. 90 pp. E.Brown, Lowell, Mass.

"How to Keep Boilers Clean," and other valuable information for steam users and engineers. Book of sixty-four pages, published by Jas. F. Hotchkiss, 84 John St., New York, mailed free to any address.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Combination Roll and Rubber Co., 27 Barclay St., N. Y. Wringer Rolls and Moulded Goods Specialties.

Cope & Maxwell M'f'g Co.'s Pump adv., page 254.

Punching Presses & Shears for Metal-workers, Power Drill Presses, $25 upward. Power & Foot Lathes. Low Prices. Peerless Punch & Shear Co., 115 S. Liberty St., N.Y.

Pure Oak Leather Belting. C. W. Arny & Son, Manufacturers, Philadelphia. Correspondence solicited.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro. 234 Broadway, New York.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited. Erie, Pa.

Peck's Patent Drop Press. See adv., page 269.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 10 Cortlandt St., N.Y.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

Saw Mill Machinery. Stearns Mfg. Co. See p. 269.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 268.

Improved Skinner Portable Engines. Erie, Pa.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 286.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 286.

Safety Boilers. See Harrison Boiler Works adv., p. 285.

Supplee Steam Engine. See adv. p. 270.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 286.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Silica Paints (not mixed); all shades. 40 Bleecker St., N.Y.

For best Portable Forges and Blacksmiths' Hand Blowers, address Buffalo Forge Co., Buffalo, N. Y.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., Fitchburg, Mass.

Ball's Variable Cut-off Engine. See adv., page 300.

Paragon School Desk Extension Slides. See adv. p. 300.

Brass & Copper in sheets, wire & blanks. See ad. p. 300.

The None-such Turbine. See adv., p. 286.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Wren's Patent Grate Bar. See adv. page 301.

Diamond Engineer, J. Dickinson, 64 Nassau St., N.Y.

Berryman Feed Water Heater. See illus. adv., p. 300.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Ajax Metals for Locomotive Boxes, Journal Bearings, etc. Sold in ingots or castings. See adv., p. 300.

Eagle Anvils, 10 cents per pound. Fully warranted.

Geiser's Patent Grain Thrasher, Peerless, Portable, and Traction Engine. Geiser Mfg. Co., Waynesboro, Pa.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 301.

For the manufacture of metallic shells, cups, ferrules, blanks, and any and all kinds of small press and stamped work in copper, brass, zinc, iron, or tin, address C. J. Godfrey & Son, Union City, Conn. The manufacture of small wares notions, and novelties in the above line, a specialty. See advertisement on page 301.

Rolled Nickel Anodes, Grain Nickel, Nickel Salts, Platers' Supplies. Greene, Tweed & Co., New York.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 301.

The Sweetland Chuck. See illus. adv., p 300.

Turkey Emery, Star Glue, Pumice, Walrus Leather, Polishers' Supplies. Greene, Tweed & Co., 118 Chambers St., N. Y.

Magic Lanterns and Stereopticons of all kinds and prices. Views illustrating every subject for public exhibitions, Sunday schools, colleges, and home entertainment. 116 page illustrated catalogue free. McAllister, Manufacturing Optician, 49 Nassau St., New York.

Draughtsman's Sensitive Paper. T.H.McCollin, Phila., Pa.

New Economizer Portable Engine. See illus. adv. p. 300.

Cutters for Teeth of Gear Wheels formed entirely by machinery. The Pratt & Whitney Co. Hartford, Conn.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

Common Sense Dry Kiln. Adapted to drying all of material where kiln, etc., drying houses are used. See p. 300.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Soloman's Parallel Vise, Taylor. Stiles & Co., Riegelsville, N.J.

Skinner's Chuck. Universal, and Eccentric. See p. 300.

Don't buy a Steam Pump until you have written Valley Machine Co., Easthampton, Mass.

For Machinists' Tools, see Whitcomb's adv., p. 300.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) "Harriet and Emily" ask if it is a scientific and philosophical fact and truth that an ice boat can possibly move faster than the wind. A. On good ice a well made ice boat will move much faster than the wind. A wind having a velocity of fifteen miles an hour will drive an ice boat at the rate of forty miles an hour.

(2) E. P. Y. asks: Which do the authorities on such things say is the proper position for sleeping, on the right or the left side, or on the back? A. If soon after eating lie on the right side; otherwise it is best to vary the position occasionally. It is not good to lie habitually in any one position.

(3) "Reader" writes: I have some bottles out of which I wish to make battery jars. Would you please tell me, through SCIENTIFIC AMERICAN, how I can cut the necks off? A. Bend a quarter-inch iron rod so that it will half encircle the bottle. Heat it to a low red heat, place the bottle in the bend upon the line of separation, and turn the bottle back and forth through part of a revolution in contact with the hot rod. When the bottle begins to crack turn it slowly around until the top is completely cracked off.

(4) I. J. M. writes: As you write and deal largely in the saving of "horse power" of one kind, I am emboldened to write asking your assistance in the saving of a horse power of another kind. I have a fine mare, which I am afraid has the itch. Will you be kind enough to let me know what will stop its spreading and cure it? I have tried most of the simpler remedies, such as sulphur and lard, etc., but find them next to useless. A. If the animal is a victim to a genuine case of itch, our opinion is that it will respond to liberal dressings of equal parts of tincture of iodine and glycerine mixed. We would also give two ounces of sublimed sulphur daily in her feed and thoroughly disinfect the harness, blankets, partitions, and in fact everything that has been in contact with her, with a solution of carbolic acid, diluted, the brushes especially, which should not be used upon any other animal.

(5) C. G. B. asks: 1. Can the commercial water glass be mixed with ground marble or other substance to form an artificial marble susceptible of high polish? A. Yes. See article on the subject, page 16, current volume. 2. Could it be colored, and if so, with what, say, for black? A. Lampblack, Indian red, yellow ocher, chrome green, etc, can be used in connection with these materials. 3. Where or of whom can water glass be obtained? A. See column of Business and Personal and Hints to Correspondents. 4. I notice that the "slack" cinders or refuse of soft or bituminous coal that has been burned is composed principally of iron and slate. Could not this be utilized in sidewalks by mixing with some plastic substance that would afterwards harden? What would be the best substance? A. Probably hydraulic cement of bitumen might be employed advantageously in this connection. 5. Please refer to numbers giving instructions for making cement sidewalks. A. See SCIENTIFIC AMERICAN SUPPLEMENT Catalogue. 6. Is there manufactured such an article as asbestos rope, or could rope be cheaply treated so as to resist decay when exposed to weather and moderate fire, and still be strong? A. We believe so. Address the dealers who advertise in this paper. 7. How can cellars without drains be cemented so as to exclude water and moisture? A. Put down a two-inch bed of concrete with cement, and cement over this for the floor.

(6) W. H. D. asks: 1. Is it best to leave a violin in tune after playing, or is it best to let the strings slack a little after playing? Does it not strain the violin if it is strung up always? A. Leave the violin in tune. 2. Is there anything that will make hair grow longer and stouter when there are plenty of little roots? If there is, what is it and where could I get some of it? A. Pilocarpine (or the hydrochlorate of this alkaloid), when administered by subcutaneous injection, is said to greatly stimulate the growth of hair.

(7) J. H. K. asks: Please let me know what proportion of platina surface, as compared with zinc surface, to use in a Smee battery, to get the best results? I have seen these batteries in practical use where the platina surface has varied from two-tenths to forty-one one-hundredths of what the zinc was, and as yet have been unable to find any one who knew what is right. I claim that it makes no difference how much larger your zincs are than the platina (as long as they are as large), and that the power of your battery depends on the size of the plating plates and the condition of the battery bath; but my friend claims different. I also claim that a battery with a platina plate, 12x12½ inches square, or with 300 square inches surface, with zincs to suit (working in a bath of one ounce acid to 16 ounces water), will deposit a copper shell one-one-hundred-and-fiftieth of an inch thick on a wax electrotype mould 18x21 inches from a copper anode 15x20 inches square in ten hours, if the connections are good and everything else in order. My friend says I would need large battery plates. A. The quantity of current from such a battery is increased somewhat by increasing the surface of the platinum so as to completely surround the zinc plate. When the cost of the platinum is taken into consideration, however, the gain in current by the increase of platinum surface beyond the dimensions of one of the zinc plates is not sufficient to warrant this modification. It does not matter how large an exposure of platinum surface in excess of that of zinc surface there is in such an element. As we understand your statement of conditions we do not think that your estimate of work done (in copper deposited) is excessive. Of course a stronger current would do the work more rapidly.

(8) J. E. K. asks: Can you tell us of an exterminator for roaches, with which our place is overrun? A. Finely powdered dry borax injected by means of a bellows, into all cracks and crevices infested with the roaches soon drives them away. Another good remedy applied in the same way is genuine Dalmatian insect powder. Chlorinated lime is also very effective.

(9) J. W. F. asks: Please inform me in what work I can find out how to make the material of which paint which is luminous in the dark is made? I do not want it for a paint but for another purpose. There is an article of which oyster shell is one ingredient, but anything that is solid might answer my purpose. A. You will find the information in article on Phosphorescent Substances, page 51, current volume. See also Useful Receipts, in SUPPLEMENT, No. 159.

(10) G. L. says: There is an unlimited amount of chalk, in its rough state, in this vicinity. The chalk is very soft, and is found in lumps of all sizes, and what I desire to know is, how or by what process I could make it suitable for billiard use, such as square blocks of chalk used for chalking cues. A. Reduce the chalk to a smooth thick paste by grinding it with water and about one per cent of wheat flour, mould into shape under pressure, and kiln dry at a temperature of about 100° Fah.

(11) H. L. asks: 1. How is a helix made? A. See "How to Make Induction Coils," in SUPPLEMENT, No. 160, and "Electrical Cabinet," in SUPPLEMENT, No. 191. 2. I have a battery of two carbons and one zinc; how is the connection made between battery and helix? A. Connect the wire from the carbon pole with one end of the helix wire and the zinc pole with the other so as to complete the circuit. 3. How can I make a plain black glass button look like a silver button or to give it a polish like nickel plating? A. See formulæ for silvering glass in SUPPLEMENT, No. 105.

(12) H. G. R. says: I have just laid a galvanized pipe, 1¼ inch, from spring to house, a distance of 300 feet. As you do not recommend the use of galvanized iron, can you tell me any way to remove the zinc from the inside of pipe without digging it all up? A. Owing to the unavoidable liberation of gas and the position of the pipes solvents cannot be depended upon to effectually remove all the zinc coating from such a conduit. We know of no practical way of satisfactorily accomplishing this without disturbing the line.

(13) A. B. R. asks: Can you give a recipe for making a cement for fastening rubber bicycle tire to the steel rims? The cement should be applied through the agency of heat, and a stick of it should not be brittle but easily bent at common temperature. A. A. Try the following: Melt together in an iron pot over a gentle fire, pitch and gutta percha, and stir well together. Use hot. The addition of a little shellac renders the cement harder when cold. See receipts for marine glues under Cements, page 2510, SUPPLEMENT, No. 158.

(14) E. R. G. writes: I have a lever escapment clock, ticking some two ticks per second, and a fast train watch, ticking somewhere about five beats to a second. Hanging my watch at the head of the bed, with the clock on a box by the side of it, my watch seems to lose a beat every few beats. If the clock is removed the watch beats all right, but on being replaced proceeds to drop the beat again. A. The phenomenon referred to is due to the interference of sound waves.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

J. B. S.—Impure potter's clay—useful for making tiles and sewer pipe, etc. (see other report).—G. Van S.—It is not iridium, or osmi-iridium, but magnetic iron sand—magnetite.—C. B. H.—Kaolin (porcelain clay) of fair quality.—G. E. E.—It is not quartz but glass.—W. C. H.—It is a fair quality of fire clay—useful for making fire bricks and some kinds of cheap pottery tiles and drain pipe. See column of Business and Personal and Hints to Correspondents.—J. K.—The quartz sample contains much cupreous pyrites and doubtless a little gold. An assay would be required to determine this. The crystals are altered pyrites—not tourmaline—and garnets. Stained quartz has no commercial value.—J. F.—Hornblendic rock—no value.—F. and B.—Partly altered iron sulphide pyrites. The coating is iron oxide. S. & B.—Argillaceous rock containing crystals of iron pyrites.—T. M.—1. Iron pyrites—iron sulphide. 2. (White). Fine white silica—suitable for glass making, scouring, etc. It is probable that coal exists in the vicinity.—W. E. P.—The quartz probably contains a little gold—an assay would be advisible to determine this.—D. K. E.—An impure potter's clay—similar to that of J. B. S., above.—E. W.—Quartzose rock—probably carries a little silver (see answer to W. E. P.)—A. T. B.—It is an ocher—if properly calcined and ground will make a good cheap red paint.—H. E. B. W.—Silicious kaolin—of fair quality—could be used by makers of white ware.—E. M. S.—It is limestone and quartzite. The small fragment of metal is lead.—J. M.—No. 1. Contains a large per cent of argentiferous galena. No. 2. Quartz—probably containing a little silver. These are worth assaying.—H. T.—Magnetic iron sand—contains traces of gold. Box marked, "Tuscon, Az., No. 1" (no letter), contains a sample of quartz rich in horn silver. Box marked "Ban. Pa." (no letter) contains kaolin of very fair quality.—P. W. P.—It is magnetic iron sand—not iridium ore or emery. We have received letters relating to minerals from J. R., E. P. St. J., E. E B., W. H. S., L. J., H. R. N.J. G., and J. M. W. The samples referred to have either failed to reach us, or, not having been properly labeled, it is impossible for us to identify them.—C. F. H.—The sediment is chiefly composed of iron carbonate and oxide and carbonaceous matter.—J. C. P.—It is iron sulphide—"fool's gold" in a seam of lime carbonate.—J. C. P. (F. A.)—1. Clay slate bearing a concretionary mass of partly altered pyrites and hornblende schist. 2. Compact pyrites rock. Samples in cubeb box (no label or letter). 1. Crystallized gypsum—used for making plaster of Paris. 2. Chalcopyrite—iron-copper sulphide in limestone gangue. 3. Iron sulphide in quartz. 4. Lime carbonate.—H. T.—Quartzose rock veined with marmolite.—J. M.—Titaniferous magnetite ore. Package marked "Monroe Democrat," is quartz rock carrying much sulphide of iron—possibly auriferous.—I. K.—Clay iron stone of poor quantity.—A. A. R.—1. Quartz and iron sulphide. 2. Fragment of the radiate Favosites goldfusse. 3. A portion of a crinoid or stone lily stem.—S. A. H.—1. A fine argillaceous sand, useful for scouring purposes and in the preparation of some kinds of pottery, enamels, cements, etc. 2. An impure limonite iron ore. 3. Galena—lead sulphide—a rich ore.—J. B. S.—A fair quality of earthy limonite iron ore.—J. R. E.—No sample received.

COMMUNICATIONS RECEIVED.

Theory of Revolving Storms. By J. T. P.
How to Prevent Slipping of Belts. By W. A. E.
On the Fontaine Locomotive. By G. A. T.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

October 11, 1881,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Abrasive wheel, Fullerton & Coy	248,093
Agitator or egg beater, D. H. Allen	248,004
Air compressor, Robinson & Kiser	248,218
Amalgamator, A. R. Hamlin	248,171
Animal shears, W. Hassel	248,172
Axle lubricator, I. N. Snedecor	248,225
Barbing machine, A. Van Fleet	248,264
Basin waste, H. M. Weaver	248,076
Bathing tub, H. Costello	248,144
Beading machine, F. Otto	248,204
Bed attachment for invalids, J. P. Brown	248,132
Bed bottom, A. W. Stewart	248,065
Bed bottom fastening, spring, G. B. Buell	248,133
Bed bottom, spring, E. Bunch	248,017
Bed, wardrobe, A. W. Stewart	248,064
Bell, electric call, E. A. Schoettel	248,113
Bell, gong, G. B. Owen	248,206
Bit. See Bridle bit.	
Blocks, machine for manufacturing cylindrical, C. E. Burns	248,018
Blotter, S. A. Piper	248,212
Blue, preparing leuco-base of aniline, O. Fischer	248,153
Boat. See Life boat.	
Bolt. See Rotary bolt.	
Boot and shoe sole buffing machine, J. G. Buzzell	248,020
Boots and shoes, manufacture of, J. Orcutt	248,109
Bottle, siphon, C. De Quilfeldt	248,147
Box. See Fruit box. Match, etc., box. Show box.	
Brake. See Car brake. Electro-magnetic brake.	
Bread, sandwiched, G. L. Witsil	248,247
Brick surfaces, compound for renovating, F. J. Berry	248,011
Bridle bit, J. H. Jones	248,181
Bridles, overdraw check rein attachment for, F. C. McKibben	248,105
Bronzing machine, J. H. Bingham	248,012
Broom, Bradshaw & Richardson	248,252
Broom, S. P. Fraley	248,031
Buckle, W. F. Cornelius	248,027
Buckle, G. W. Freeman	248,285

© 1881 SCIENTIFIC AMERICIAN, INC

Butter, etc., preservation of, T. F. Wilkins (r) ... 9,892
Button chuck, B. Payne ... 248,210
Button, cuff, S. Cottle ... 248,145
Button fastening, L. A. Bernheimer ... 248,082
Calipers and rule, combined, P. D. Graham ... 248,162
Camera plate holder, A. Herzog ... 248,175
Can. See Sheet metal can.
Car brake, P. Lord ... 248,048
Car coupling, H. L. Gibbs ... 248,034
Car coupling, J. B. Gillham ... 248,159
Car coupling, A. Wood ... 248,245
Car, railway, B. A. Mason ... 248,188
Car, sleeping, P. M. Melick ... 248,106
Car step, extension, N. G. Northup ... 248,201
Carriage jump seat, J. W. Anderson ... 248,005
Casting car wheel tires, N. Washburn ... 248,241
Chandelier, H. E. Shaffer ... 248,114
Check, draft, etc., A. A. Nesbit ... 248,198
Chopper. See Cotton chopper.
Chuck, drill, Croissant & Huré ... 248,088
Churn motor, M. West ... 248,243
Clamp See Floor clamp.
Clay, clay shale, etc., reducing, J. C. Anderson ... 248,080
Clay grinding machine, Hoxsie & Pifer ... 248,042
Clothes pounder, L. Study ... 248,232
Cock device, water indicating gauge, J. B. Snyder 248,226
Coloring matter, O. N. Witt ... 248,246
Coloring matter, preparing, O. Fischer ... 248,154
Colters, machine for beveling plow. R. C. Nugent. 248,053
Cooking eggs by hot air, apparatus for, P. L. Labarbe ... 248,100
Cooler. See Milk cooler.
Cotton chopper, J. M. Walden ... 248,237
Coupling. See Car coupling.
Cultivator, J. C. F. Hammer ... 248,170
Cultivator fender attachment. I. S. Bates ... 248,129
Cup. See Oil cup.
Damper, stove, C. G. Marshall ... 248,191
Delivery apparatus, J. J. Clause ... 248,024
Dental flask guide. J. S. Campbell ... 248,022
Desk. school, F. G. Johnson ... 248,043
Dish, covered. J. A. Eads ... 248,090
Drum, heating, A. Meyer ... 248,049
Ear jewels, fastening for, G. W. Washburn ... 248,240
Electro-magnetic brake, H. Walter ... 248,238, 248,239
Elevator. See Hay elevator.
Elevator safety device, A. C. Ellithorpe ... 248,150
Engine. See Steam engine.
Exercising machine, E. A. Tuttle ... 248,121
Extractor. See Stump extractor.
Eyeglass, F. R. Woodward ... 248,079
Fair leader for ropes, etc., J. W. Sharrett ... 248,061
Fanning mill hurdle, J. H. & D. H. Houston ... 248,178
Feed water heater and purifier, A. Berney ... 248,008
Feeder, automatic hog, H. T. Phenix ... 248,211
Fence, H. Ogborn ... 248,202
Fence wire stretcher, S. M. Stevens ... 248,063
Firearm, breech-loading, W. H. Baker ... 248,249
Firearm lock, W. Mason ... 248,190
Firearm, revolving, D. Smith ... 248,223
Fire extinguisher, Burritt & Castle ... 248,253
Fire extinguisher, automatic, A. S. Harris ... 248,088
Fireproof composition C. C. Gilman ... 248,092
Floor clamp, J. A. Brown ... 248,015
Flower crock, A. D. Polsgrove ... 248,213
Frame. See Vehicle dash frame.
Freezing of water in railway and other tanks, apparatus for preventing the, J. R. Kinley ... 248,099
Fruit box, R. J. Cooke ... 248,143
Fruit jar, C. House ... 248,058
Funnel and gauge rod, combined, S. T. Bleyer ... 248,013
Furnace. See Heating and puddling furnace. Hot air furnace. Hydrocarbon furnace. Ore roasting and chloridizing furnace. Puddling furnace. Smoke consuming furnace. Straw burning furnace.
Gas burner, electric lighting, D. Rousseau ... 248,217
Gas, process of and apparatus for generating water, B. Van Steenbergh ... 248,070
Gate, G. D. Herring ... 248,040
Globes, mounting terrestrial, H. H. Gross ... 248,259
Grain binder take-up and tension, M. G. Hubbard 248,261
Grain binder tension, B. F. Ennis ... 248,091
Grain scourer, A. Seibert ... 248,060
Grate, J. R. Fish ... 248,155
Grate, G. Hayner ... 248,039
Grinding mill, P. Steinmetz ... 248,118
Harrow, L. Silland ... 248,221
Harrow, J. H. Stokesbary ... 248,231
Harvester heading machine, M. B. Erskine ... 248,254
Hat and bonnet fastening, J. A. M. Bouvier ... 248,251
Hat finishing machine, Kearcher & Edgett ... 248,182
Hay elevator, D. Dockstader ... 248,149
Hay rack, A. G. Barton ... 248,006
Hay rake and tedder, I. L. Landis ... 248,185
Heater. See Feed water heater.
Heating and puddling furnace, W. Rumble ... 248,059
Heating furnace, B. D. Childrey ... 248,141
Hinge for bracelets, spring, T. B. Cleveland ... 248,142
Hog scraping machine. M. Crawford ... 248,087
Holder. See Camera Plate holder.
Hoop planing machine, barrel, H. F. Campbell ... 248,021
Horse detacher, C. W. Bennet ... 248,250
Hot air furnace. A. H. Brown ... 248,016
Hub cap, vehicle, O. W. Swift ... 248,066
Hydrocarbon furnace, Park & Heath ... 248,110
Ice machine for the manufacture of, C. W. Gelett 248,157
Insulating substances, filling telegraph cables with, W. R. Patterson ... 248,209
Jar. See Fruit jar.
Key for locking bolts, etc., G. B. Taylor ... 248,067
Keys, manufacture of, H. C. Hart ... 248,095
Knitting machine, circular, G. W. Lewis ... 248,102
Ladder, combined step and extension, C. A. Boardman ... 248,014
Lamp, electric, Fox & Böhm ... 248,156
Lamp, electric, J. W. Langley ... 248,187
Lamp, electric, Sample & Rabl ... 248,111
Lamp for sewing machines, C. G. Desprin ... 248,148
Lamp post, electric, Mason & Westcott ... 248,189
Lantern, E. P. Follett ... 248,256
Latch, lifting, F. Clymer ... 248,025
Lathe, turning, Sellers & Bancroft ... 248,263
Leather graining and dicing machine, Schray & Braentigam ... 248,220
Lifeboat, A. Holmes ... 248,097
Life preserving mattress, E. Whitfinch ... 248,078
Lock. See Firearm lock. Nut lock. Permutation lock.
Locomotive ash pan, M. B. O'Neill ... 248,203
Locomotive, compressed air, R. Hardie ... 248,037
Locomotive spring, T. J. Farrell ... 248,152
Lubricator. See Axle lubricator.
Mail bag catcher, J. W. Rochford ... 248,058
Malt kilns, trap door for, W. Toepfer ... 248,068
Mash tub, O. F. Boomer ... 248,084
Match, etc., box, W. Trotter, Jr. ... 248,236
Match safe, I. L. Landis ... 248,184
Meteorology, apparatus for, W. Klinkerfues ... 248,183
Milk cooler, I. C. Wightman ... 248,123
Mill. See Ore pulverizing mill.
Mop, G. H. Kidney ... 248,044
Motion, device for converting, D. Porter ... 248,214
Motor. See Churn motor.
Necktie fastening, Standiford & Todd ... 248,228
Nut lock, F. R. Hewitt ... 248,176
Oil cup, J. Old ... 248,055
Ore concentrator, W. Thurmond ... 248,234
Ore pulverizing mill, W. I. Tustin ... 248,122
Ore roasting and chloridizing furnace, R. A. Nevin 248,199
Ore separator, H. J. Müller ... 248,196
Organ, reed, H. W. Smith ... 248,224
Package, hermetically sealed paper, H. C. Crocker 248,146
Packer, oil well, L. Stewart ... 248,229
Pan. See Locomotive ash pan.
Paper hanging machine and rack, H. Staib ... 248,227
Pen, stylographic, A. T. Cross (r) ... 9,890
Permutation lock, G. M. Hathaway ... 248,173
Photographic apparatus, D. H. Houston ... 248,179
Phototypography, H. Goodwin ... 248,035
Pianofortes, repeating action for, D. L. Bollermann ... 248,131
Piston and plunger for hydraulic machinery, E. Thayer ... 248,116
Pitman, A. H. Merriman ... 248,193
Planter, A. S. Houck ... 248,180
Planter and fertilizer distributer, combined hand, O. Stoddard ... 248,230
Plow and drill, combined, Moore & Johnson ... 248,107
Post. See Lamp post.
Press. See Roller press.
Puddling furnace, J. Bergqvist ... 248,081
Pump attachment, force, French & Anderson ... 248,032
Pumps, removable cylinder for steam, J. H. Vaile 248,069
Rack. See Hay rack.
Railway, rope, Chamberlain & Kemp ... 248,140
Rake. See Hay rake.
Regulator. See Watch regulator.
Roller press, O. F. Boomer ... 248,083
Roofing and paving composition, C. M. Warren ... 248,072
Roofing and paving material, C. M. Warren ..248,073, 248,075
Roofing, paving, and varnish material, C. M. Warren 248,074
Rotary bolt, W. D. Watrous ... 248,242
Saw, drag, M. L. Nichols ... 248,200
Saw, hand, L. Lawson ... 248,045
Saw mill feed mechanism, J. H. Elward ... 248,151
Scale beam supporting device, W. W. Hopkins ... 248,177
Scourer. See Grain scourer.
Screw, H. A. Harvey ... 248,164
Screw threads, apparatus for feeding blanks to machines for rolling, H. A. Harvey ... 248,166
Screw threads, feeding mechanism in machines for rolling, H. A. Harvey ... 248,163
Screw threads, machine for rolling, H. A. Harvey 248,165
Screws and screw bolts, manufacturing, H. A. Harvey ... 248,168
Screws, manufacture of, H. A. Harvey ... 248,169
Screws, threading, H. A. Harvey ... 248,167
Sealing device, J. H. Cassidy ... 248,086
Seat. See Carriage jump seat.
Separator. See Ore separator.
Sewage and ventilating the pipes therefor, removing house, H. Reese ... 248,216
Sewing machine, button hole, J. H. Munson ... 248,197
Sewing machine needle, A. F. Gerald ... 248,158
Sewing machine needles, machine for pointing, R. Thompson ... 248,120
Shears. See Animal shears.
Sheet metal can, V. Lopez ... 248,103
Sheet metal cans, aciding machine for making, J. W. Farrell ... 248,255
Shirt, T. M. Dunham ... 248,030
Shoe vamps, machine for folding, K. Vogel ... 248,071
Show box, J. J. Langlés ... 248,186
Shutter box, H. B. Ayer ... 248,128
Signal. See Telephone signal.
Signaling apparatus, individual, C. E. Buell ... 248,137
Sinks, sewers, etc., apparatus for the odorless emptying of, U. Götzenbrügger ... 248,160
Siphon, J. J. Powers ... 248,215
Slate, double reversible, J. D. McDade ... 248,104
Smoke and spark consumer, G. H. Burrows ... 248,019
Smoke consuming furnace, A. Berney ... 248,007
Soldering machine, J. Graves ... 248,161
Spark arrester and consumer, A. Berney ... 248,009
Spark consumer, A. Berney ... 248,010
Spindle. See Spinning machine spindle.
Spinning machine spindle, G. W. Stafford ... 248,062
Spoke feeding machine, rotary, O. Allen ... 248,124
Spring. See Locomotive spring. Vehicle spring.
Stage scenery, operating, J. Crossy ... 248,028
Stamp, electro-magnetic ore, C. F. Pike ... 248,056
Steam engine, W. M. Henderson ... 248,096
Steam trap, S. Lawson ... 248,101
Steam trap, W. O. White ... 248,077
Steamboat chimneys, operating, J. Christy (r) ... 9,889
Stone, cutter for machines for cutting cylindrical forms from, J. Gazeley ... 248,033
Stove reservoir, oil, L. C. Heckman ... 248,174
Straw burning furnace, E. W. Loomis ... 248,046
Stump extractor, D. O'Brien ... 248,054
Supporter. See Telegraphic tape supporter.
Table for sewing and other machines, G. W. Burgess ... 248,085
Tap for beer, etc., J. F. Paulfranz ... 248,262
Telegraph cables, armoring lead pipes of, W. R. Patterson ... 248,208
Telegraph line, subterranean, J. B. Morgan ... 248,052
Telegraph relay and sounder, W. E. Davis ... 248,089
Telegraph, telephonic, C. E. Buell ... 248,136
Telegraphic relay, E. A. Schoettel ... 248,012
Telegraphic tape supporter, E. J. McLoughlin ... 248,192
Telephone exchange apparatus, C. E. Buell ... 248,138
Telephone exchange system, C. E. Buell ... 248,134
Telephone signal, C. E. Buell ... 248,135
Telephonic and telegraphic system, J. M. Stearns, Jr ... 248,115
Telephonic receiver, J. M. Stearns, Jr ... 248,117
Telephonic transmitter, J. M. Stearns, Jr ... 248,116
Tie. See Umbrella and parasol tie.
Time piece balance, J. A. Miller ... 248,050
Tire tightener, B. F. Carlon ... 248,139
Tongue support, M. Conrad ... 248,026
Toy, panorama, E. Schissel ... 248,219
Toys, mechanical movement for, G. Otto ... 248,205
Trap. See Steam trap.
Truck bolster, car, E. E. Pratt ... 248,057
Tub. See Bathing tub. Mash tub.
Type, H. H. Thorpe ... 248,233
Type setting machine, W. A. Lorenz ... 248,047
Umbrella and parasol tie, D. W. Odiorne ... 248,108
Valve, steam engine, G. A. Gray, Jr ... 248,036
Vehicle dash frame, G. M. Peters (r) ... 9,891
Vehicle spring, S. Chittenden ... 48,02
Vehicle wheel, D. A. Foster ... 248,257
Ventilator, C. A. Ferdericks ... 248,09
Ventilator, J. Patchett ... 248,20
Vest, L. Witkowsky ... 248,244
Voting apparatus, A. C. Beranek ... 248,130
Wagon, dumping, T. D. Slauson ... 248,222
Wagon, road, E. B. Towl ... 248,235
Washing machine, F. L. Wickham ... 248,265
Watch pendant, safety, C. S. Hirst ... 248,260
Watch regulator, J. A. Awalt ... 248,126
Watch safety pinion, J. A. Awalt ... 248,127
Water closet bowl, porcelain, G. R. Moore ... 248,195
Water meter casing, Moore & Anschütz ... 248,194
Water meter, mercury, C. H. Bacon ... 248,248
Water wheel, turbine, K. Anunsen ... 248,125
Wheel. See Abrasive wheel. Vehicle wheel. Water wheel.
Windmill gearing, A. C. Monger ... 248,051
Wood, composition for filling the pores of, F. Donnet ... 248,029
Yeast, W. H. Higgins ... 248,041

DESIGNS.

Carpet, W. L. Jacobs ... 12,515
Carpet, C. Magee ... 12,518
Cloths, nap surface for, F. Samson ... 12,519
Newel post, J. I. Healey ... 12,514
Statuette, C. Buberl ... 12,522
Tobacco, plug, J. F. Wooldrige ... 12,521
Type, movable, J. A. St. John ... 12,520
Wall paper, E. Leissner ... 12,516, 12,517

TRADE MARKS.

Cigars, H. Feltman ... 8,717
Cigars and cigarettes, J. W. Dimmitt & Co ... 8,715, 8,716
Cosmetics, F. Smith ... 8,725
Cough sirup, W. H. Mix ... 8,721
Knives, plated silver, J. Russell Cutlery Company ... 8,723
Knives, table, butcher, and hunting, J. Russell Cutlery Company ... 8,724
Matches, Swedish, Jönköpings Tändsticks-Fabriks Aktie-Bolag ... 8,718
Medical preparation, Weeks & Potter ... 8,727
Perfume, toilet, G. Kemp ... 8,728
Pills, anti-bilious purgative, J. F. Smith ... 8,726
Thread, linen machine, Ross, Turner & Co ... 8,722
Tobacco, cigars, and cigarettes, chewing and smoking, Leidersdorf & Mendel ... 8,719
Toilet powders and pomatum, C. Meyer ... 8,720

English Patents Issued to Americans.

From October 7 to October 11, 1881, inclusive.

Bessemer converter, A. L. Holley, Brooklyn, N. Y.
Bolt securing device, G. B. Taylor *et al.*, U. S.
Boot sole trimmer, D. C. Knowlton, Boston, Mass.
Compressed air apparatus, C. W. Cooper, Brooklyn, N. Y.
Fire lighter, A. G. Elliot, San Francisco, Cal.
Galvanic battery, J. Stebbins. New York city.
Lock, A. H. Elliott, New York city.
Mill for grinding corn, etc., A. L. Roach, Indianapolis Ind.
Mill for grinding corn, etc., J. FitzGerald, Brooklyn, N. Y.
Needle for knitting machine, S. Perberdy, Phila., Pa.
Steam engine, J. Ericsson, New York city.
Vacuum pans, C. Wahl, Chicago, Ill.
Water pipe, M. Marx, New York city.

Advertisements.

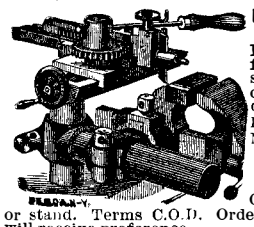
Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
(About eight words to a line.)

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

INVENTORS

There has never been a better time to sell good inventions or to secure capital for the purpose of developing them. Money is unusually plenty and capitalists are actively seeking good investments. We undertake the sale of patents, entire or in part, secure partners, and form joint stock companies. Highest references given. Circulars free.

E. L. RICHARDS & CO.,
733 Broadway, New York.



Universal Hand Planer, Judson's Patent.

Having ceased to manufacture this tool, by reason of expiration of license, we shall close out our stock at the following prices:

No. 2 planes 2 in $25.00
" 4 " 4 " 35.00
" 6 " 6 " 40.00
" 8 " 8 " 45.00

Complete, with either vise or stand. Terms C.O.D. Orders accompanied by cash will receive preference.
OLD COLONY RIVET CO., Kingston, Mass.

$88 A week to Agents. **$10 OUTFIT FREE.** RIDEOUT & CO., 10 BARCLAY ST., New York.

Magic Lanterns and Stereopticons,
With Views for Public and Private Exhibitions, made by
JAMES W. QUEEN & CO.,
924 Chestnut St., Philadelphia, Pa.
Priced and illustrated catalogue of 130 pages sent on application.

Our new patent Petroleum Lamp is superior to all others; the light passed on to the screen by the condensing lenses is equal to 350 candles. All interested are invited to call and examine it.

BAND SAW BLADES Patent Process. Send for sample saw and catalogue. H. A. KIMBALL, A t., 614 Filbert St., Philadelphia, Pa.

AGENTS WANTED to sell a new Novel Account Book to business men. Energetic parties can easily make **$25** to **$75 per week.** Specimen sheet of ruling and printing, with terms, etc., by return mail. Address
H. W. PAMPHILON, Pub., 30 Bond St., New York City.

FOREMAN MOULDER WANTED.—COMPETENT ON agricultural work, bench and floor moulding. Address NOXON BROS M'F'G CO., Ingersoll, Canada.

YOU can make money with my outfit for making **RUBBER STAMPS!** S. A. BROWN, Buffalo, N. Y.

The New Ring Puzzle, with instructions, 25c., postpaid. Wm. Scharnweber, 1551 Milwaukee Av., Chicago, Ill.

NEW YORK STENCIL WORKS
STEEL LETTER'S **STEEL** **STAMPS** STEEL DIES, &c.
87 NASSAU ST. N.Y.

DRAWING INSTRUMENTS.
Swiss, German Silver, and Brass.
Drawing Paper, Paints, and Materials.
TAPE MEASURES.
Priced and Illustrated Catalogue sent on application.
WM. V. McALLISTER.
728 Chestnut Street, Philadelphia.

WOOD WORKING MACHINERY.
PLANING, MATCHING, MOLDING, MORTISING, TENONING, CARVING, MACHINES. BAND & SCROLL SAWS UNIVERSAL AND VARIETY WOOD WORKERS, &c. &c.
J. A. FAY & CO.
CINCINNATI, O. U. S. A.

DRY AIR REFRIGERATING MACHINE. Description of Hall's improved horizontal dry air refrigerator, designed to deliver about 10,000 cubic feet of cold air per hour, when running at a speed of 100 revolutions per minute, and capable of reducing the temperature of 90° above to 50° below zero. With five figures, showing plan and side elevation of the apparatus, and diagrams illustrative of its performance. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **288.** Price 10 cents. To be had at this office and from all newsdealers.

MINERAL WOOL.
This Fireproof and indestructible material success. fully prevents loss of heat by radiation, keeps frost from water pipes, deadens sound, checks spread of fire in walls, partitions, floors of dwellings. 25 cts. per cubic foot.
U. S. MINERAL WOOL CO., 16 Cortlandt St., N. Y.

ON THE SPACE PROTECTED BY A Lightning Conductor. An important contribution to electrical science, by Mr. W. H. Preece, in which the author shows by the aid of diagrams the amount of space that will be protected by a lightning-rod of any given dimensions. Illustrated with five figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **288.** Price 10 cents. To be had at this office and from all newsdealers.

ALL KINDS OF **WOOD WORKING MACHINERY** IRON WORKING TOOLS & SPECIAL TOOLS, THE MANUFACTURED BY **H.B. SMITH MACHINE Co.** SMITHVILLE, BUR. CO. N. J. CIRCULARS FREE.

RIDDELL'S NEW ELEMENTS of HAND RAILING.
Revised edition, containing 41 plates, 13 of which are entirely new, with accompanying letterpress descriptions. Price $7. E. CLAXTON & CO., 930 Market St., Phila., Pa.

CHEMISTRY OF BUILDING MATERIALS. The bearings of chemical science on certain prominent materials used for building purposes, such as stones, limes, mortars, cements, brick, marble, etc. 1. A brief account of the general principles of chemistry. The chemical substances which enter into the composition of the above-named materials, their characteristics, and directions for ascertaining their presence in any mineral. 2. Examination in detail of the several varieties of stone found in the earth, both as regards the proportions of their constituents, and their chemical and other properties. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **279.** Price 10 cents. To be had at this office and from all newsdealers.

The Victor Rock Drill
WELL BORER AND PROSPECTOR.
The *Diploma* and *Prize Medal* awarded it at the "Centennial" in 1876. *Twenty-six of these hand machines ordered in one day.* **Good active Agents can clear $125 per week.** Send for Circulars and Terms.
Address W. WEAVER, Phœnixville, Pa.

ON THE CALORIFIC POWER OF FUEL on Thomson's Calorimeter. An important paper by J. W. Thomas F.C.S., F.I.C., in which the author points out the disadvantages of Thomson's calorimeter, and recommends a new and uniform method of procedure to ascertain the relative calorific power of different coals, and by means of which the great differences in the results obtained by chemists may be overcome. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **288.** Price 10 cents. To be had at this office and from all newsdealers.

OLD HICKORY CEMENT.
The best on earth for mending everything; 25c. bottle sent as sample, post paid, on receipt of 15c. Catalogue of 1000 fast selling articles free. **E. NASON & CO.,** MANUFACTURERS, **111 Nassau St., New York.**

BOOK of over **150** Elegant **Needlework Designs** for Embroidery of all kinds, Lacework, etc., with diagrams showing the method of making all the stitches, 12c.; two for 20c., postpaid. PATTEN & CO., 47 Barclay St., New York.

PREVENTION OF DIPHTHERIA.—BY Dr. Edwin R. Maxson. An examination of the history, causes, and pathology of this widely prevalent affection, offers a number of thoughtful suggestions as to how it may be prevented and finally exterminated. This is a paper of great interest and value to physicians and parents. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **281.** Price 10 cents. To be had at this office and from all newsdealers.

THE MEDART PATENT WROUGHT RIM PULLEY
THE LIGHTEST, STRONGEST, NO SHRINKAGE STRAINS. PERFECT BALANCE.
THE CHEAPEST PULLEY IN THE MARKET
ANY SIZE OR FACE. STRAIGHT OR CROWNED, TIGHT OR LOOSE. SPLIT OR WHOLE, SINGLE DOUBLE OR TRIPLE ARMS. LARGE PULLEYS A SPECIALTY.
THE HARTFORD ENGINEERING CO. HARTFORD CONN.

PATENTS.

MESSRS. MUNN & CO. in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine Improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had *thirty-five years' experience*, and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

We also send, *free of charge*, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world.

MUNN & CO., Solicitors of Patents,
37 Park Row, New York.

BRANCH OFFICE.—Corner of F and 7th Streets, Washington, D. C.

© 1881 SCIENTIFIC AMERICIAN, INC

PRACTICAL DRAUGHTSMAN'S

Book of Industrial Design,

AND

MACHINIST'S AND ENGINEER'S

DRAWING COMPANION.

Forming a Complete Course of Mechanical, Engineering, and Architectural Drawing. From the French of M. Armengaud the elder, Professor of Design in Conservatoire of Arts and Industry, Paris, and MM. Armengaud the younger, and Amoroux, Civil Engineers. Rewritten and arranged with additional matter and plates, selections from and examples of the most useful and generally employed mechanism of the day. By William Johnson, Assoc. Inst. C. E. Illustrated by fifty folio steel plates, and fifty wood cuts. A new edition, 4to. $10

Among the contents are: Linear Drawing, Definitions, and Problems. Sweeps, Sections, and Mouldings, Elementary Gothic Forms, and Rosettes. Ovals, Ellipses, Parabolas, and Volutes. Rules and Practical Data. Study of Projections, Elementary Principles. Of Prisms and other Solids. Rules and Practical Data. On coloring Sections, with applications. Conventional Colors, Composition or Mixture of Colors. Continuation of the Study of Projections—Use of Sections—details of machinery. Simple applications spindles, shafts, couplings, wooden patterns. Method of constructing a wooden model or pattern of a coupling. Elementary applications. Rules and Practical Data.

THE INTERSECTION AND DEVELOPMENT OF SURFACES, WITH APPLICATIONS.—The Intersection of Cylinders and Cones. The Delineation and Development of Helices, Screws, and Serpentines. Application of the helix—the construction of a staircase. The Intersection of Surfaces—applications to stop cocks. Rules and Practical Data.

THE STUDY AND CONSTRUCTION OF TOOTHED GEAR.—Involute, cycloid, and epicycloid. Involute, Cycloid. External epicycloid, described by a circle rolling about a fixed circle inside of it. Internal epicycloid. Delineation of a rack and pinion in gear. Gearing of a worm with a worm wheel. Cylindrical or Spur Gearing. Practical delineation of a couple of Spur wheels. The Delineation and Construction of Wooden Patterns for Toothed Wheels. Rules and Practical Data.

CONTINUATION OF THE STUDY OF TOOTHED GEAR.—Design for a pair of bevel wheels in gear. Construction of wooden patterns for a pair of bevel wheels. Involute and Helical Teeth. Contrivances for obtaining differential Movements. Rules and Practical Data.

ELEMENTARY PRINCIPLES OF SHADOWS.—Shadows of Prisms, Pyramids, and Cylinders. Principles of Shading. Continuation of the Study of Shadows. Tuscan Order. Rules and practical data.

APPLICATION OF SHADOWS TO TOOTHED GEAR.—Application of Shadows to Screws. Application of Shadow to a Boiler and its Furnace. Shading in Black—Shading in Colors.

THE CUTTING AND SHAPING OF MASONRY.—Rules and Practical Data. Remarks on Machine Tools.

THE STUDY OF MACHINERY AND SKETCHING.—Various applications and combinations; The Sketching of Machinery. Drilling Machines; Motive Machines; Water wheels. Construction and Setting up of water wheels. Delineation of water wheels. Design of a water wheel. Sketch of a water wheel. Overshot water wheels, Water Pumps; Steam Motors; High-pressure expansive steam engine. Details of Construction; Movements of the Distribution and Expansion Valves; Rules and Practical Data.

OBLIQUE PROJECTIONS.

PARALLEL PERSPECTIVE.

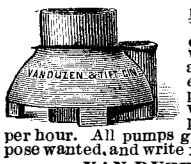
TRUE PERSPECTIVE.—Elementary principles. Applications—flour mill driven by belts. Description of the mill. Representation of the mill in perspective.

EXAMPLES OF FINISHED DRAWINGS OF MACHINERY.

☞ The above, or any of our Books, sent by mail, free of postage, at the publication price, to any address in the world.

HENRY CAREY BAIRD & CO.,
Industrial Publishers, Booksellers, and Importers,
810 WALNUT STREET, PHILADELPHIA.

WATER ELEVATOR, OR STEAM JET PUMP.



Has no valves or moving parts. With 60 lb. steam pressure will elevate hot or cold water 50 ft., will force water through pipes and hose for fire purposes. *Cheapest and Best Pump made.* A 1½ in. pump will throw a ⅝ stream of water 40 ft.; 2½ in. pump at 50 lb. pressure, elevates 3,000 gal. 28 ft. per hour. All pumps guaranteed. State for what purpose wanted, and write for prices, etc.

VAN DUZEN & TIFT, Cincinnati, O.

SPEAKING TELEPHONES.

THE AMERICAN BELL TELEPHONE COMPANY,

W. H. FORBES, *President.* W. R. DRIVER, *Treasurer.* THEO. N. VAIL, *Gen. Manager.*

Alexander Graham Bell's patent of March 7, 1876, owned by this company, covers every form of apparatus, including Microphones or Carbon Telephones, in which the voice of the speaker causes electric undulations corresponding to the words spoken, and which articulations produce similar articulate sounds at the receiver. The Commissioner of Patents and the U. S. Circuit Court have decided this to be the true meaning of his claim; the validity of the patent has been sustained in the Circuit on final hearing in a contested case, and many injunctions and final decrees have been obtained on them.

This company also owns and controls all the other telephonic inventions of Bell, Edison, Berliner, Gray, Blake, Phelps, Watson, and others.

(Descriptive catalogues forwarded on application.)

Telephones for Private Line, Club, and Social systems can be procured directly or through the authorized agents of the company.

All telephones obtained except from this company, or its authorized licensees, are infringements, and the makers, sellers, and users will be proceeded against.

Information furnished upon application.

Address all communications to the

AMERICAN BELL TELEPHONE COMPANY,
95 Milk Street, Boston, Mass.

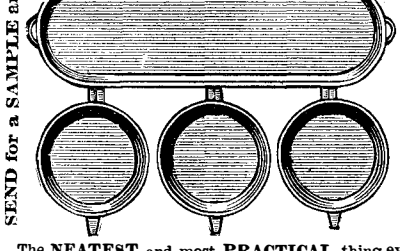
SEND TO LONDON, BERRY & ORTON PHILA PA FOR
THE BEST BAND SAW BLADE

50 BEAUTIFUL ALL NEW DESIGNS of Butterfly, Dragon-fly, Robin Redbreast, Pinks, Pansies, Violets, and Moss Rosebud Chromo Cards, name on, 10c. Card Mills, Northford, Ct.

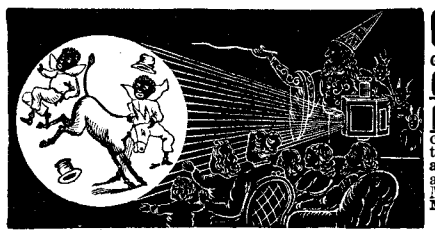
WANTED.—ENGINE AS NEAR 15-INCH CYLINDER and 36 stroke. State if cut-off valve on left or right side
Box 3396, Boston, Mass.

SCHOFIELD'S PATENT
CAKE GRIDDLE

SEND for a SAMPLE and CANVASS YOUR TOWN.



The **NEATEST** and most **PRACTICAL** thing ever seen. Pleases everybody. Every family wants one. No one after using will be without for many times its cost. ☞ **The Round Pans** being hinged separately, each cake can be turned into the long pan as soon as it is sufficiently done on one side, and the round pan returned ready for another cake. The Griddles are made of cast-iron and weigh 4 lbs. Sample griddle by express in shipping box 60c., by mail registered $1.25. **POSTAGE STAMPS TAKEN.** Send for sample griddle and terms to agents; canvass your town right away, you will be surprised at the great number of orders you will get. Address F. M. VAN ETTEN, Manuf'r, 208 LaSalle St., Chicago, Ill.

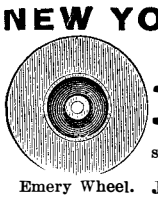


ORGANITA (Upright Organette) with Music, *only* **$5.00**
EDISON'S INSTANTANEOUS GUIDE TO PIANO AND ORGAN, 7 Tunes and Instructions ☞ *Circulars FREE.* **$1**

GREAT OPTICAL WONDER MAGICAL MEGASCOPE ONLY $2.50.

1001 Pictures from books, papers, cards, can be cast upon the wall, magnified and brilliantly illuminated; chromo cards *in all their colors*; the works of a watch in motion. Photographs enlarged to life size; useful to portrait artists, and amateurs. Delights everybody, young and old; has 50 pictures and two handsome nickel reflectors. *Circulars free.*
MAGIC LANTERNS with 60 Slides, only $20
Magic Lanterns and Slides Wanted. *Illustrated Catalogue, 150 pp.* 3c.
THEO. J. HARBACH, 809 Filbert St., Philadelphia, Pa

NEW YORK BELTING AND PACKING COMP'Y.
The Oldest and Largest Manufacturers of the Original
SOLID VULCANITE
EMERY WHEELS.

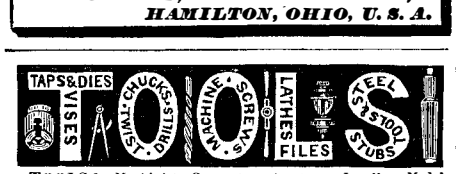


Emery Wheel.

All other kinds Imitations and Inferior. Our name is stamped in full upon all our standard **BELTING, PACKING, and HOSE.**
Address **NEW YORK BELTING AND PACKING CO.,**
JOHN H. CHEEVER, Treas. NEW YORK.

WOOD-WORKING MACHINERY.

☞ Universal Wood Workers, Planing, Matching, Moulding, Band and Scroll Sawing Machines, Carriage, Wagon and Wheel Machinery, etc.
BENTEL, MARCEDANT & CO.,
HAMILTON, OHIO, U. S. A.



TOOLS for Machinists, Carpenters, Amateurs, Jewellers, Model Makers, Blacksmiths, etc. *Send for Catalogue,* and state *what kind* of Tools you require.
TALLMAN & McFADDEN,
607 Market St., Philadelphia, Pa.

Steam Fitters' & Plumbers' Supplies.
STURTEVANTS' FAN BLOWERS.
ALBERT BRIDGES, 46 Cortlandt Street, New York.

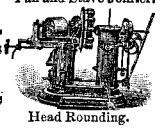
Chamfering, Howeling, and Crozing.

BARREL, KEG, HOGSHEAD, AND Stave Machinery.

Fan and Stave Jointer.

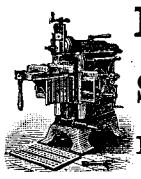
Over 50 varieties manufactured by
E. & B. HOLMES,
Buffalo, N. Y.

Truss Hoop Driving.



Head Rounding.

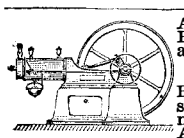
GOLD, SILVER, and NICKEL PLATING.
A trade easily learned. Costs little to start, and pays well. The Electro-Plater's Guide, a complete manual, sent free for three stamps. Complete outfits from $1. Outfits can be had on easy terms. All kinds of electrical apparatus on hand and experimental work made to order. Frederick Lowey, 90 Eleventh St., Brooklyn, N.Y.



PATENT QUICK
Adjustable Stroke
SHAPERS
Can be Changed while in Motion.
E. GOULD & EBERHARDT,
NEWARK, N. J.

STEWART'S READY ROOFING

For STEEP and FLAT ROOFS of all kinds; can be applied by ordinary workmen at ONE THIRD the cost of TIN. Send for a sample and our circular which gives full directions how to apply your own roof; also how to repair leaky roofs of all kinds. Address,
W. H. STEWART,
74 Cortlandt St., New York.

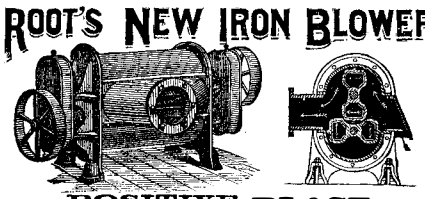


An engine that works without Boiler. Always ready to be started and to give at once full power.
SAFETY, ECONOMY, CONVENIENCE.
Burns common Gas and Air. No steam, no coal, no ashes, no fires, no danger, no extra insurance. Almost no attendance.

THE NEW OTTO SILENT GAS ENGINE.
Useful for all work of small stationary steam engine. Built in sizes of 2, 4, and 7 H. P. by **SCHLEICHER, SCHUMM & CO.,** 3045 Chestnut Street, Phila., Pa. **A. C. Manning,** 38 Dey St., New York, Agent.

I WILL SELL TWO PATENT RIGHTS TO CURE Piles, Dyspepsia, and Fevers, etc.
DR L. HEINS, Brunswick, Ga.

ROOT'S NEW IRON BLOWER.



POSITIVE BLAST.
IRON REVOLVERS, PERFECTLY BALANCED,
Has Fewer Parts than any other Blower.
P. H. & F. M. ROOTS, Manufacturers,
CONNERSVILLE, IND.
S. S. TOWNSEND, Gen. Agt., 6 Cortland St., 8 Dey St.,
COOKE & CO., Selling Agts., 6 Cortland Street,
JAS. BEGGS & CO., Selling Agts. 8 Dey Street,
NEW YORK.
SEND FOR PRICED CATALOGUE.

THE WHITE IS KING.
It has the finest finished wood-work and is the BEST MADE. Its shuttle is in the market. Its needle is self-threading; its bobbin can be removing; so simple in construction and light-running that a child can use it. It is filled without attachments or attachments.
WARRANTED
FOR FIVE YEARS.
Agents can make more money handling the "White" than any other.
Address, for particulars,
WHITE SEWING MACHINE CO.
CLEVELAND, OHIO.

PUBLIC SALE OF LETTERS PATENT
OF **JOHN F. KELLER,** FOR
GRAIN and FERTILIZING DRILLS.

On Tuesday, 20th of December, 1881, at 11 o'clock A. M., in front of the Court House at Hagerstown, Md., by virtue of a power given them and to effect a settlement between us, we will sell the following valuable patent rights, most of which were used on the Keller Drill; many of them are now used on the Hagerstown Drills. About 1,200 of these drills have been sold during this year, and the demand for them is increasing. These patents will be offered separately or together, and, if desired by buyers, in State rights also.

Letters Patent, No. 46,364, date of issue February 14, 1865, relates to elastic and non-elastic feed rollers, with gauges, slides, etc.

Patent No. 50,140, issued September 26, 1865, relates to check link for limiting spring bar, with attachments.

Patent No. 61,543, issued January 29, 1867, relates to sharp-edged fertilizer feed slides, with attachments.

Patent No. 61,544, issued January 29, 1867, relates to axles, gear wheels and shields, etc. (subject to State rights of Henry Kuhlman to manufacture in Illinois and Missouri).

No. 61,545, issued January 29, 1867, relates to fulcrum placed between boot and spring hoe; also, vibrating seats, etc.

No. 90,556, issued May 25, 1869, relates to fertilizers and wheat sowers, with gauges opening each way from the center.

No. 104,854, issued June 28, 1870, relates to double acting reversible movement of fertilizer feeder.

No. 105,810, issued July 26, 1870, relates to slide block for adjusting the angle of spring hoes.

No. 105,811, issued July 26, 1870, relates to double rotary fertilizer sower.

No. 137,929, issued April 15, 1873. A peculiar arrangement of locking bars or hoe shifting.

No. 150,328, issued April 28, 1874, relates to improved slide blocks, with attachments.

No. 153,345, issued July 21, 1875, and reissued as No. 8,343 and No. 8,344.

No. 8,343 relates to throwing axle rail out of way of hoes.

No. 8,344 relates to portable hoe shifting rails.

Each of the above patents expires seventeen years from date of issue.

Terms cash, or fifty per cent. of all purchase money cash on day of sale, balance within twenty days thereafter, at the election of the purchaser. When paid for, respective rights will be duly assigned.

THE HAGERSTOWN AGRICULTURAL IMPLEMENT MANUFACTURING CO., Hagerstown, Md.

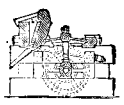
For fuller information, apply to JOHN F. KELLER, Patentee, Martinsburg, W. Va.

We will also sell, at same time and place, and on same terms, our own patents, No. 184,010, issued November 7, 1876, for improvement in sowing fertilizers, and Patent No. 213,509, issued March 25, 1879, for improvement on grain and grass seed sowers. Both of the above patents are now being used on the Hagerstown Drill built by us.

HAGERSTOWN AGL. IMP. M'F'G CO.

SUPERIOR SUBSTITUTE FOR WOOD ENGRAVING.
MOSS ENGRAVING CO.
INCORPORATED 1880. (MOSS'S NEW PROCESS.)
535 PEARL STREET, COR. ELM, NEW YORK.
Engravings of Portraits, Buildings, Landscapes, Machinery, Maps, Etc., for Newspapers, Books, Catalogues, Etc. Much cheaper than Wood Cuts.
THE LARGEST ESTABLISHMENT OF THE KIND IN THE WORLD.

"BLAKE'S CHALLENGE" ROCK BREAKER.
Patented November 18, 1879.



For **Macadam Road** making, Ballasting of Railroads, Crushing **Ores,** use of **Iron Furnaces,** etc. Rapidly superseding our *older styles* of Blake Crusher on account of its superior *strength, efficiency,* and *simplicity.* Adopted by important Railway and Mining Corporations, Cities, and Towns. First Class Medals of *Superiority* awarded by American Institute, 18 9 and 1880.
BLAKE CRUSHER CO., Sole Makers, New Haven, Conn.

HOPE FOR THE DEAF
Dr. Peck's Artificial Ear Drums
PERFECTLY RESTORE THE HEARING and perform the work of the **Natural Drum.** Always in position, **but invisible to others.** All Conversation and even whispers heard distinctly. **We refer to those using them.** Send for descriptive circular with testimonials. Address,
H. P. K. PECK & CO., 858 Broadway, New York.

$3 Press Prints envelopes, cards, etc. [Self-inker $4]. Press for circulars, etc., $8. 12 other sizes. Do your own printing. Pleasure or money making; old or young. Everything easy; printed instructions. Catalogue of Presses, Type, Cards, etc., for two stamps.
Address Manufacturers, **Kelsey & Co., Meriden, Conn.**

RUPTURE
cured without an operation or the injury trusses inflict by Dr. J. A. SHERMAN'S method. Office, 251 Broadway, New York. His book, with Photographic likenesses of bad cases, before and after cure, mailed for 10c.

From the Cradle to the Grave.—A large elegant engraving, size 19x24—Garfield & family with graphic scenes of his life. 22 fine cuts on the one heavy plate. The family group occupies the centre place. Single copies 25c., $6 per hundred.—300,000 sold in New York and Brooklyn in 2 weeks. J. W. SHERRY & Co., Publishers, 33 Barclay street, N. Y.—Agents wanted everywhere.

DISTILLATION AND RECTIFICATION of Alcohols by the Rational Use of Low Temperatures.—By Raoul Pictet. A technical paper of interest, describing the author's new apparatus for performing at one operation, in vacuo and at low temperatures, both distillation and rectification—the two results being effected at a saving of manual labor, the products being superior in quality. Illustrated with one figure, showing the new apparatus. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **299.** Price 10 cents. To be had at this office and from all newsdealers.

165 RACE ST. **JAS. MURDOCK JR.** CINCINNATI.
MACHINISTS SUPPLIES IN **BRASS. COPPER. SILVER.** GERMAN
SEND FOR WIRE, ROD, SHEET & TUBE IN THE THREE METALS. PRICE LIST

THE CATHEDRALS OF GREAT BRITAIN. Full page illustrations, with descriptions of the following Cathedrals noted for their architectural beauty and proportions, published in the SCIENTIFIC AMERICAN SUPPLEMENT, as follows: *Ely Cathedral,* SUPPLEMENT, No. **145.** *Bath Abbey Church,* SUPPLEMENT, No. **169.** *Wells Cathedral,* SUPPLEMENT, No. **196.** *Lichfield Cathedral,* SUPPLEMENT, No. **219.** *Worcester Cathedral,* SUPPLEMENT, No. **238.** *Carlisle Cathedral,* SUPPLEMENT, No. **244.** *Lincoln Cathedral,* SUPPLEMENT, No. **262.** *Peterborough Cathedral,* SUPPLEMENT, No. **285.** *Chichester Cathedral,* SUPPLEMENT, No. **290.** *Glasgow Cathedral,* SUPPLEMENT, No. **300.** Price 10 cents each. To be had at this office and from all newsdealers.

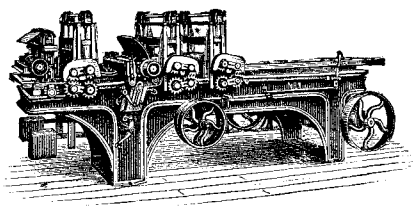
OLD RELIABLE.
NO FAILURE IN SIXTEEN YEARS
HEALD & MORRIS, CENTRIFUGAL PUMPS
100 TO 35,000 GALLS PER MINUTE CAPACITY
HEALD & MORRIS Baldwinsville N.Y.

FOR SALE,
A well established Iron and Steel Foundry, in the city of Louisville, Ky. Address
JULIUS BARBAROUX, Secy., Louisville, Ky.

Surveyors' Compasses, with Folding Sights of Hard Bronze, very stiff and strong. Protracters, Pocket Compasses, Triangles, Curves, etc. Write to A. W. PHILO, 7 Jacob St., Troy, N. Y.

BATTERIES, WIRES, MAGNETS, INSTRUMENTS, TELEGRAPH AND ELECTRICAL SUPPLIES. CATALOGUE FREE. C. E. JONES & BRO., CINCINNATI, O.

PATENTS For Sale.—Valuable rights in almost any line of manufacture. Also stock in organized companies. Send for circulars. Patents sold. CHAMBERLIN & CO., Brokers, 34 Park Row, New York.



WITHERBY, RUGG & RICHARDSON, Manufacturers of Patent Wood Working Machinery of every description. Facilities unsurpassed. Shop formerly occupied by R. Ball & Co., Worcester, Mass. Send for Catalogue.

THE EFFECTS OF CARDING AND Drawing Processes on Cotton Fibers, shown by magnified figures of the fibers as they appear after each of the operations in the manufacture of cotton, up to and including the third drawing. A paper of value to manufacturers of cotton as throwing light on the respective functions of Carding and Combing Machines. Illustrated with 8 figures drawn from the microscope. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **300.** Price 10 cents. To be had at this office and from all newsdealers.

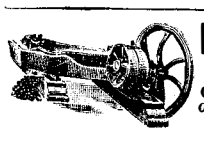
ASTHMA *Quickly and Permanently*
Dr. Stinson's Asthma Remedy is unequaled as a positive Alterative and Cure for **Asthma and Dyspepsia,** **CURED**
and all their attendant evils. It does not merely afford temporary relief, but is a permanent cure. Mrs. B. F. Lee, of Belmore, O., says of it: "*I am surprised at the speedy effects of your remedy. It is the first medicine in six years that has loosened my cough and made expectoration easy. I now sleep all night without coughing.*" If your druggist does not keep it, send for treatise and testimonials to
H. P. K. PECK & CO.,
853 Broadway, New York.

DAMPER REGULATORS and Gage Cocks. Murrill & Keizer, Baltimore.

PATENTS FOR SALE AT A SACRIFICE.
Address J. V. K., Box 225, Middletown, Pa.

PLAYS! PLAYS! PLAYS! PLAYS!
For Reading Clubs, for Amateur Theatricals. Temperance Plays. Drawing Room Plays, Fairy Plays, Ethiopian Plays, Guide Books. Speakers. Pantomimes. Tableau Lights, Magnesium Lights, Colored Fire. Burnt Cork, Theatrical Face Preparations, Jarley's Wax Works, Wigs, Beards, Moustaches. Costumes, Charades, and Paper Scenery. New Catalogues sent free, containing full description and prices. **SAMUEL FRENCH & SON 38 E. 14th St., New York.**

ELECTRIC LIGHTS THOMSON & HOUSTON SYSTEM OF THE ARC TYPE ESTIMATES GIVEN & CONTRACTS MADE & 631 ARCH ST. PHILADELPHIA PA.



FORSTER'S CRUSHER AND CRUSHER AND PULVERIZER,
The simplest machine ever devised for the purpose.
We warrant 50 per cent. advantage in *Crushing* with one-third power, and in combined Crushing and Pulverizing do the work of stamp and Burrs at one-third first cost. Can be *operated with any kind* of power.
Address TOTTEN & CO., Pittsburg, Pa.

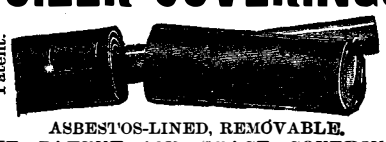
© 1881 SCIENTIFIC AMERICIAN, INC

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
(About eight words to a line.)
Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

BOILER COVERINGS

Toope's Patent. August, 1879.



ASBESTOS-LINED, REMOVABLE.
THE PATENT AIR SPACE COVERINGS.
THE CHALMERS-SPENCE CO., Sole Proprietors,
10 Cortland St. Foot of East 9th St., New York.

SPECIAL OFFER!

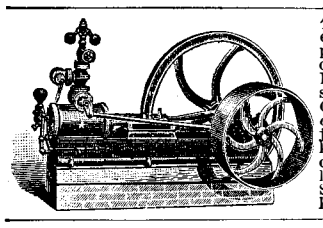
TEN POUNDS of our NEW CROP TEAS, Black, Green, or Mixed, sent by express, charges paid, on receipt of $6.
A Beautiful Oil Chromo, Size 20x24,
of our lamented President

GARFIELD

will be mailed with every $6 order.
Now is your time to ENJOY A CUP OF GOOD TEA at almost Half Price, and a perfect likeness, in oil, of our martyred President, or **GET UP CLUBS** among your friends. On $20 orders we deduct 15 per cent off, *pay all express charges*, and inclose the chromo, one for every five pounds.

The Great American Tea Co,

(P. O. Box 289), 31 AND 33 VESEY ST., N. Y.



THE STRONGEST, most complete, and *reliable* of Engines and Boilers. Special sizes, 4 to 40 H. P. Others on application. Also jointless steam kettles and machinery generally. Geo. W. Tifft, Sons & Co., Buffalo, N. Y.

SUN LIGHT GAS MACHINE. Simplest, cheapest, and most reliable. No water used. Send for circular.
J. A. DRAKE, Cincinnati, Ohio.

NEW YORK BELTING AND PACKING
THE **RUBBER PACKING,** COMPANY
For Engines, Boilers, Pumps, and all other mechanical uses, has always been a specialty with us.
37 & 38 PARK ROW, NEW YORK.

ROCK DRILLS & AIR COMPRESSORS.
INGERSOLL ROCK DRILL CO.,
1 PARK PLACE NEW YORK.

ROOFING.

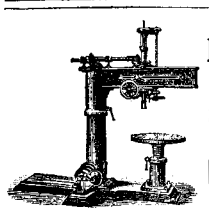
For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free. Agents Wanted. T. NEW, 32 John Street, New York.

H.W.JOHNS'
ASBESTOS
LIQUID PAINTS,

ASBESTOS ROOFING,
ASBESTOS BOILER COVERINGS,
ASBESTOS LINING FELT,
ASBESTOS STEAM PACKING,
ASBESTOS WICK PACKING,
ASBESTOS FLAT PACKING,
ASBESTOS MILLBOARD,
ASBESTOS GASKETS,
ASBESTOS SHEATHINGS,
COATINGS, CEMENTS, Etc.

Descriptive price lists and samples sent free.

H. W. JOHNS M'F'G CO.,
87 Maiden Lane, New York.



FOR
HEAVY PUNCHES, SHEARS,
Boiler Shop Rolls,
Radial Drills, Etc.
SEND TO
HILLES & JONES
WILMINGTON, DEL.

MACHINISTS' TOOLS.

NEW AND IMPROVED PATTERNS.
Send for new illustrated catalogue.
Lathes, Planers, Drills, &c.
NEW HAVEN MANUFACTURING CO.,
New Haven, Conn.

JENKINS PATENT PACKING
THE STANDARD
MAKES A PERFECT JOINT
JENKINS BROS. 71 JOHN ST. NY.

Jarvis Furnace Co.

Patent Setting for Steam Boilers Burns Screenings and Slack Coal without Blast. No. 7 Oliver St., Boston; No. 92 Liberty St., New York: No. 709 Market St., St. Louis; No. 18 Second St., Baltimore.

FOOT PRESSES.
STILES & PARKER PRESS CO., Middletown, Ct.

CLARK'S RUBBER WHEELS.
This Wheel is unrivaled for durability, simplicity, and cheapness. Adapted for Warehouse and Platform Trucks, Scales, Heavy Casters, and all purposes for which Wheels are used. Circular and Price List free.
GEO. B. CLARK, Windsor Locks, Ct.

The Phosphor-Bronze Smelting Co. Limited.

TRADE MARKS.

Phosphor-Bronze.

New Offices and Salesroom,
512 Arch Street,
PHILADELPHIA
PA.

PHOSPHOR-BRONZE
Wire, Rods, Sheets, Bolts, etc.

Pamphlets and Particulars on Application.

OWNERS OF THE U. S. PHOSPHOR-BRONZE PATENTS.
Sole Manufacturers of Phosphor-Bronze in the U. S.

WIRE ROPE

Address JOHN A. ROEBLING'S SONS, Manufacturers, Trenton, N. J., or 117 Liberty Street, New York.
Wheels and Rope for conveying power long distances. Send for circular.

THE PORTER-ALLEN
High Speed Steam Engine.

ADDRESS
SOUTHWARK FOUNDRY & MACHINE CO.,
430 Washington Ave., Philadelphia, Pa.

THE BAKER BLOWER.

[FORCED BLAST.]

The best in the World for Charcoal Blast Furnaces.
Also for melting Iron in Cupolas for Stove Foundries, etc.
WILBRAHAM BROS,
No. 2320 Frankford Avenue,
PHILADELPHIA, PA.
☞ SEND FOR OUR CATALOGUE. ☜

ERICSSON'S
New Caloric Pumping Engine

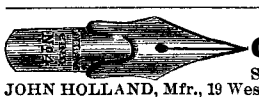
FOR
DWELLINGS AND COUNTRY SEATS.
Simplest cheapest, and most economical pumping engine for domestic purposes. Any servant girl can operate. Absolutely safe. Send for circulars and price lists.
DELAMATER IRON WORKS
C. H. DELAMATER & CO., Proprietors,
No. 10 Cortlandt Street, New York, N. Y.

Round Writing

USEFUL FOR EVERYBODY

Text Book with Instruction and Pens, $1.50.
KEUFFEL & ESSER, 127 Fulton St., New York.

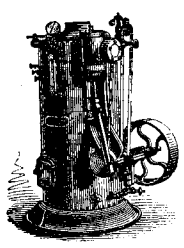
WM. A. HARRIS,
PROVIDENCE, R. I. (PARK STREET),
Six minutes walk West from station.
Original and Only builder of the
HARRIS-CORLISS ENGINE
With Harris' Patented Improvements, from 10 to 1,000 H. P.



FOR BEST
COLD PENS.
Send for Price List to
JOHN HOLLAND, Mfr., 19 West 4th St., Cincinnati.

IRIDIUM:
THE HARDEST METAL KNOWN.

Not attacked by acids or alkalies; not oxidized in the air; almost infusible. Manufactured under John Holland's process (patented May 10, 1881) by
THE AMERICAN IRIDIUM CO.,
S. E. Corner Pearl and Plum Sts, Cincinnati, Ohio.



BOOKWALTER ENGINE.
Compact. Substantial. Economical, and easily managed; guaranteed to work well and give full power claimed. Engine and Boiler complete, including Governor, Pump, etc., at the low price of

3	HORSE POWER	$240 00
4½	" "	280 00
6½	" "	355 00
8½	" "	440 00

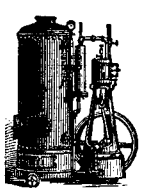
☞ Put on cars at Springfield, O.
JAMES LEFFEL & CO.,
Springfield, Ohio,
or 110 Liberty St., New York.

Pond's Tools,
Engine Lathes, Planers, Drills, &c.
DAVID W. POND, Worcester, Mass.

DRUNKENNESS And the OPIUM Habit CURED
By LESLIE E. KEELEY, M.D., Surgeon, C. & A. R. R. Dwight, Ill. ☞ Books Free.

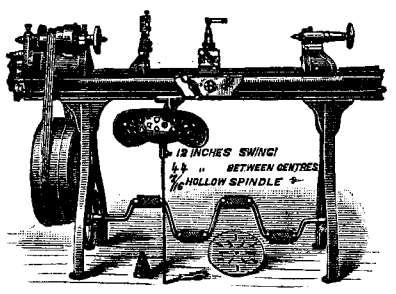
PAYNE'S AUTOMATIC ENGINES.

Established 1840



Spark Arrester.

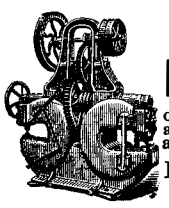
Reliable, durable, and economical, *will furnish a horse power with one-third less fuel and water than any other engine built* not fitted with an automatic cut-off. Send for Illustrated Catalogue "A" 2, for information and prices. **B. W. PAYNE & SONS,**
Box 1207. Corning, N. Y.



BARNES' PATENT FOOT POWER MACHINERY.
Complete outfits for actual Workshop business. Lathes, Saws, Formers, Mortisers, Tenoners, etc. Descriptive Catalogue and Price List free.
W. F. & JOHN BARNES,
1999 Main Street, Rockford, Ill.

THE J. L. MOTT IRON WORKS,
88 and 90 Beekman St., New York.

Demarest's Patent Water Closets used almost exclusively in all fine work. **Demarest's** Water Closets, Latrine's and Hopper's for public buildings and factories. **Mott's Celebrated Porcelain Lined Baths** unequaled for beauty and cleanliness. **Sanitary Goods** of all kinds.



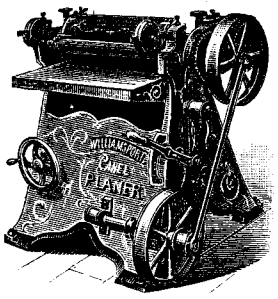
FOR A
COMBINED
Punch and Shears
of beautiful design, of great strength and capacity, and thoroughly reliable, address
Lambertville Iron Works,
LAMBERTVILLE, N. J.

FRIEDMANN'S PATENT INJECTOR,
THE BEST
Boiler Feeder
IN THE WORLD.
Simple, Reliable, and Effective.
40,000 IN ACTUAL USE.
NATHAN & DREYFUS,
Sole Manufacturers, NEW YORK.
Send for Descriptive Catalogue

COLUMBIA BICYCLE.
The Bicycle has proved to self to be a permanent, practical and vehicle, and the number in daily use is rapidly increasing. Professional and business men, seekers after health or pleasure, all join in bearing witness to its merits. Send 3 cent stamp for catalogue with price list and full information.
THE POPE M'F'G CO.,
597 Washington Street, Boston, Mass.

Double Screw, Parallel, Leg Vises.
Made and WARRANTED *stronger* than any other Vise by FISHER & NORRIS only, Trenton, N. J.

PERSONAL, TO OWNERS OF PATENTS.
We make a specialty of manufacturing Light Hardware goods for owners of patents, by the quantity, at a low figure. GEO. VAN SANDS & CO., Middletown, Conn.



WILLIAMSPORT Pony or Panel Planer. For general use in Door Shops, Box and Furniture Manufactories. For planing Door Panels, Cigar Box Stuff, and Furniture work, it has no equal.
We use the Ellis Patent three part Journal Box and a solid forged steel head. Two pressure bars. Has strong feed. Will plane from 1-16 to 6 inch thick. Weight, 1,400 lb. The lowest priced first class planer in the market. Send for illustrated catalogue and price list to
ROWLEY & HERMANCE, Williamsport, Pa.

THE SCOVILL
"Pop" Safety Valve,
SIMPLE, RELIABLE, DURABLE,
For Locomotive, Stationary, Marine, and Portable Boilers.
Send for descriptive circulars and price lists to
THE HANCOCK INSPIRATOR CO.,
BOSTON, MASS.

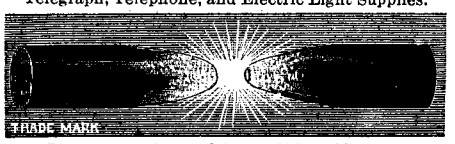
SAWS 40,000 SAWS
EMERSON'S ILLUSTRATED SAWYERS HAND BOOKS (FREE) TO ANY PART OF THE WORLD.
FULL SIZE PLANER SAW TOOTH 3 CENTS EACH
ADDRESS EMERSON, SMITH & CO. BEAVER FALLS, PA

Geo. W. Read & Co.,
Manufacturers of and Dealers in
MAHOGANY,
And all Foreign and Domestic
Cabinet Woods.
SOLE MANUFACTURERS
CUT AND PRESS DRIED
THIN LUMBER,
FOR
CIGAR BOXES,
Panel Stock, Etc., Etc.

Mills and Warerooms:
186 to 200 Lewis St., New York.

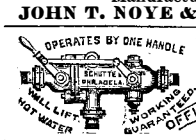
DO YOUR OWN PRINTING
Presses and outfits from $3 to $500
Over 2,000 styles of type. Catalogue and reduced price list free.
H. HOOVER, Phila., Pa

THE WALLACE DIAMOND CARBONS.
Telegraph, Telephone, and Electric Light Supplies.



THE ELECTRICAL SUPPLY CO.,
109 Liberty St., New York.

Stevens' Roller Mills,
FOR
GRADUAL REDUCTION OF GRAIN.
Manufactured exclusively by
JOHN T. NOYE & SONS, BUFFALO, N. Y.



KORTING
UNIVERSAL INJECTOR
FOR BOILER FEEDING
Send for circular
PHILADA. 12TH & THOMPSON STS.
NEW YORK 109 LIBERTY ST.
BOSTON 7 OLIVER ST.

HARTFORD
STEAM BOILER
Inspection & Insurance
COMPANY.
W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec'y.

MAGIC LANTERNS
And STEREOPTICONS, all prices. Views illustrating every subject for **PUBLIC EXHIBITIONS, etc.** ☞ *A profitable business for a man with small capital.* Also Magic Lanterns for home amusement. 116-page cat. *free.*
McALLISTER, Mfg. Optician, **49 Nassau St., N. Y.**

GARFIELD Agents wanted for Life of President Garfield. A complete, faithful history from cradle to grave, by the eminent biographer, Col. Conwell. Books all ready for delivery. An elegantly illustrated volume. Indorsed edition. Liberal terms. Agents take orders for from 20 to 50 copies daily. Outsells any other book ten to one. Agents never made money so fast. The book sells itself. Experience not necessary. Failure unknown. All make immense profits. Private terms free. GEORGE STINSON & Co., Portland, Maine.

30 DAYS TRIAL ALLOWED.

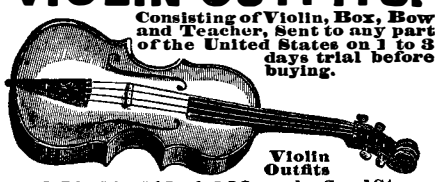
We will send on 30 days trial
DR. DYE'S
Electro-Voltaic Appliances.

Invented by the **eminent Dr. A. M. Dye,** and especially designed for the cure of all **Nervous Diseases, General Debility, Lost Vigor** and **Manhood,** the result of **abuses** and **other** causes. Also for Liver and Kidney Diseases, Rheumatism, Neuralgia, Paralysis, Rupture, **Female Troubles** and **many other diseases.** Wonderful cures quickly effected. Illustrated pamphlet sent free. Address,
VOLTAIC BELT CO., Marshall, Mich.

SHAFTS PULLEYS HANGERS
At Low Prices. Large Assorted Stock.
A. & F. BROWN, 57-61 Lewis St., New York.

ICE AT $1.00 PER TON.
PICTET ARTIFICIAL ICE CO., Limited,
P. O. Box 3083. 142 Greenwich St., New York.
Guaranteed to be the most *efficient* and *economical of all* existing Ice and Cold Air Machines.

VIOLIN OUTFITS.
Consisting of Violin, Box, Bow and Teacher, Sent to any part of the United States on 1 to 3 days trial before buying.



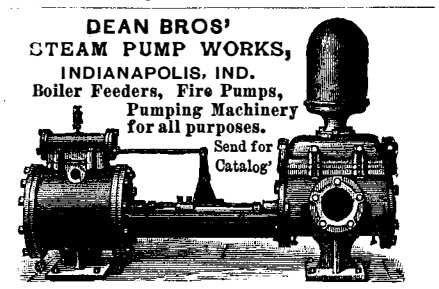
Violin Outfits

at $8.50, $7., $12. & $22. each. Send Stamp for **Beautifully Illustrated** 32 page Catalogue of Violins, Guitars, Banjos, Cornets, Flutes, Strings all kinds, Harmonicas, Organ Accordeons, Music Boxes, &c. **Lowest Prices.** Mail Orders a Specialty. C. W. Story, 26 Central St. Boston, Mass.

MACHINERY
of every description. 121 Chambers and 103 Reade Sts., New York. THE GEORGE PLACE MACHINERY AGENCY.

HAND BLOWERS and PORTABLE FORGES made by EMPIRE PORTABLE FORGE CO., Cohoes, N. Y., are the strongest and best. Send for circulars.

DEAN BROS'
STEAM PUMP WORKS,
INDIANAPOLIS, IND.
Boiler Feeders, Fire Pumps,
Pumping Machinery
for all purposes.
Send for Catalog



KIRKHAM, HULETT & CHANDLER'S
STANDARD WASHER-SCRUBBER.
Removes all the Ammonia and a large percentage of the CARBONIC ACID and SULPHURETED HYDROGEN from GAS. Adopted by over 100 Gas Companies in Europe and by the Baltimore, Williamsburg, Citizens' (Newark, N. J.), Newport, R. I., St. Joseph, Mo., and Quebec Gas Companies. GEO. SHEPARD PAGE,
49 Wall St., New York, Sole Agent.

PRINTING INKS.
THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts. Philadelphia, and 59 Gold St., New York.

© 1881 SCIENTIFIC AMERICIAN, INC